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VETERINARY MEDICINE

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Small Animal Practice Issue II

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No. 11
VOL. XXVI

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VOL. XXVI NOVEMBER, 1931 No. 11

Published Monthly by the Veterinary Magazine Corporation
75 East Wacker Drive, Chicago, Ill., U. S. A.
$4.00 a Year

Entered as second-class matter Nov. 8, 1920, at the post office at Chicago, Ill., under the Act of Mar. 3, 1879.
Entered as second-class matter under the title of American Journal of Veterinary Medicine, July 19, 1910, at Chicago, Illinois, under Act of March 3, 1879.

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D. M. Campbell, Editor A. T. Kinsley, Associate Editor

Small Animal Practice Issue II

A SURPRISING circumstance in connection with the changes that have come about in the field of veterinary practice in a score of years is the failure of many to recognize the importance of that branch of veterinary practice that serves the owners of animal pets.

The American Veterinary Medical Association certainly cannot be accused of being indifferent to the welfare of any branch of the veterinary profession, and one must conclude that it was due solely to lack of information as to the importance of small animal practice that it delayed, until very recently establishing, a separate section for those interested in this branch of veterinary service, notwithstanding the most insistent demands for such a section, from a considerable number of influential members of the Association. The instant success of the section on small animals when it was finally established affords sufficient evidence of the need for it. The continued preponderance of time given to equine anatomy and to diseases of the horse in veterinary college curricula is perhaps due to a further failure to appreciate the changed conditions that influence veterinary practice at the present time.

The report of the Committee on Education of the A. V. M. A. presented at the Kansas City meeting in August is illuminating in this respect. This report was prepared by the late Dean Bemis and comprised the results of a two-year study of the whole veterinary situation. Dean Bemis puts the total number of graduate veterinary practitioners in the United States at 9,359 and the number interested in any degree in the treatment of pets at 81 per cent, or more than 7,500. More important, however, is his findings that the attention given to pets is equivalent to the whole time of 2,250 veterinarians and that 1,010 give more than 75 per cent of their time to small animal practice. It seems reasonable to conclude that double this number, or 2,000, are engaged from 25 per cent to 75 per cent of their time in small animal practice, making altogether 3,000 for whom the treatment of pet animals is an important source of income. This places the number engaged in this type of practice well ahead of the numbers engaged to an equal extent in horse practice or swine practice or all phases of public health work combined, and makes it second only to the number engaged in cattle practice.

The experience of VETERINARY MEDICINE in the publication of a special Small Animal Practice issue in April, 1929,

substantiates in a measure the foregoing conclusion. The success of that issue was instantaneous. The continued demand for it after all copies of the regular issue were exhausted led to the preparation of a reprint, with more substantial binding than that of the magazine. It was deemed that 1,000 reprints would be amply sufficient to supply any demand that might accrue, inasmuch as all subscribers already had this same material in copies of the magazine, but this supply of reprints was soon exhausted and a second reprint of the same quantity issued, which in turn was exhausted, and within a year from the date of the original publication, and in April, 1930, a third reprint, increased to 80 pages, was issued. Of the 1,000 copies of the third reprint, more than half have already been disposed of, and the indications are that the remaining copies may be insufficient to supply the demand for it that eventually will accrue.

That more than 2,500 veterinarians should want this collection of articles in a form convenient for reference, seems sufficient evidence that this number at least among the subscribers to VETERINARY MEDICINE look upon service to the owners of pet animals as being an important part of their professional service and for which they want the latest authoritative information in a form readily available.

This second Small Animal Practice issue like the first, has been prepared under the supervision of Howard J. Milks, Professor of Veterinary Medicine and Director, Small Animal Clinic, New York State Veterinary College, Cornell University. We believe that it possesses outstanding excellence. Credit for whatever merit it may possess is due to Doctor Milks and the numerous contributors who have made this special issue possible.

But few of the subjects discussed in the first Small Animal Practice issue have been included in the discussions in this one. In a very real sense, discussions in this issue are built upon the foundation laid in the first special issue. Thus, chloroform, ether and A. C. E. mixture anesthesia combined with the basal narcotics, morphine, atropine and H. M. C., either alone or in combination, were discussed in the former special issue, and nembutal, avertin, pernocton, sodium amytal, and nitrous oxide anesthesia are discussed in this issue. Rapid progress in the field of discovery has likewise seemed to justify the discussion of distemper prophylaxis to be found herein, notwithstanding this subject received extensive discussion in the earlier special issue.

Owing to the limited space available, not all of the articles prepared for this issue could be included. The following have been held over and will appear in early issues:

Examination and Interpretations of the Analysis of the Urine of the Dog, by C. E. Hayden, Ithaca, N. Y.

Biological Relationships in the Control of Canine Taeniasis, by R. F. Bourne, Ft. Collins, Colo.

Fractures in Small Animal Practice, by Edwin R. Blamey, New York City.

Some Diseases of the Digestive System, by H. J. Milks, Ithaca, N. Y.

Psychology in Small Animal Practice, by Wm. E. Ruggles, Portland, Oreg.

Elimination in the Dog, by Roy H. Spaulding, White Plains, N. Y.

Deficiency Diseases and the Proper Feeding of Dogs, by Richard A. Self, Dallas, Tex.

Running Fits or Canine Hysteria, by W. E. Frink, Hollywood, Calif.

Common Ailments of Hunting Dogs, by I. M. Hays, Auburn, Ala.

Pus in the Antrum, by D. B. Crane, Ithaca, N. Y.

Hemorrhagic and Necrotic Pancreatitis, by D. B. Crane, Ithaca, N. Y.

Hospital Hygiene and Sanitation, by S. W. Haigler, St. Louis, Mo.

X-Ray Technique, by Richard A. Self, Dallas, Tex.

Cancer of Testicle, by Albert E. Merry, Syracuse, N. Y.

Epidural Anesthesia, by S. E. Ferguson, Lake Geneva, Wisc.

Acute Toxemia in the Dog, by Alfred W. Meyer, New York City.

Why Neglect Feline Practice, by H. W. Brown, Ft. Wayne, Ind.

Nembutal Anesthesia in Dogs and Cats and a number of others.

Bacillary Necrosis in Cats

By CHAS. W. BOWER, Topeka, Kansas

BACILLARY necrosis of cats may be described as a chronic skin disease which is characterized by multiple abscesses within a more or less circumscribed necrotic area. These areas are found generally on the tail, feet, and occasionally upon the body. There are many synonyms for the condition—skin rot, fistulous dermatitis, skin canker, and necrotic dermatitis.

Traumatisms such as bites and other wounds of a penetrating nature are predisposing causes of this disease. Bruises likewise are responsible especially when the skin is slightly broken. The *Bacillus necrophorus* is directly responsible for the necrosis. This organism is generally picked up from the soil. The writer has never observed this disease in a cat that remained inside the house all of the time, but on the contrary it is very common among cats that spend most of their lives out of doors.

If this disease attacks the feet or lower part of the legs a decided lameness is the first symptom noticed. Frequently the hip will be affected which will cause the animal to remain in a recumbent or sitting position. When the tail is affected a definite dropping of the tail is noted and, upon handling, the cat resents it and manifests extreme pain. When the head and neck regions are affected the muscles appear to be stiff and the animal holds the head slightly extended.

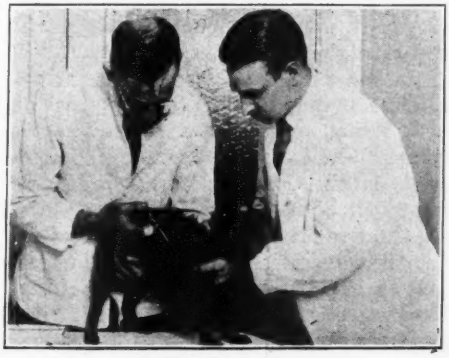
Upon a closer examination a definite area will be found, which is generally denuded of hair and the skin is of a purplish color. The area which is circumscribed is swollen and fluctuating; indicating that there is a fluid beneath. Occasionally the examination reveals an opening in the skin, which is discharging a reddish, purulent exudate. In fact, there may be numerous openings, all discharging pus. There is generally an odor, which is characteristic of necrophorus infection. Afterwards the skin breaks and permits the pus to escape. A continuous discharge generally follows, leaving deep fistulous tracts, which do not heal readily. The pus is frequently mixed with fragments of broken down, necrotic tissue.

If the necrotic areas are only local, not much disturbance of the general health is noticed. However, if the condition is generalized, the patient becomes very emaciated, the appetite poor. In the majority of such cases, the patients succumb to acute septicemia.

If the abscess has not broken it is advisable to lance it and establish drainage. If the case is a mild one, this, together with frequent applications of Dakins antiseptic solution, will bring about healing. However, it is very rare for the practitioner's attention to be called so easy as the abscess has generally broken and deep fistulae are present when the case is brought to him. In these cases one should give a general anesthetic and completely remove all of the necrotic skin, open all of the fistulae and curette deeply. After this operation a wet dressing of Dakins solution should be applied daily. It is sometimes necessary to cauterize the wound every three to five days to promote proper healing.

The affected parts should always be kept bandaged, so the patient will not gnaw at them and spread the infection to other parts of the body.

Clients should be instructed to give immediate care to fight wounds, thereby preventing the development of bacillary necrosis.



Dog Distemper Antiserum

By G. W. DUNKIN, M.R.C.V.S., D.V.H., Mill Hill, London, N.W.7.
National Institute for Medical Research, Farm Laboratories.

THE use of immune serum both for the prevention and treatment of dog distemper is not new, but the results following the use of the majority of such sera have not been very encouraging. The majority of these sera (until quite recently, all of them) are prepared by immunizing some large animal, such as a horse, with bacteria or bacterial products of various kinds. The organisms employed have been chosen because they were regarded by the authors as the true infective agent in distemper, or because they were commonly encountered in cases of that disease and could be regarded as secondary infective agents.

The following examples of antibacterial sera which have made their appearance on the market, may be mentioned:

(1) *Serum Gans:* This is a polyvalent heterologous serum prepared by immunizing horses against bacteria isolated from cases of distemper, and fresh strains are from time to time secured for this purpose.

(2) *Serum Piorkowski*: This serum is prepared nowadays by immunizing horses against the organism originally isolated by this worker and named after him.

(3) *Antistreptococcal Serum*: In this case horses are immunized with streptococci and the polyvalent antistreptococcal serum of the Pasteur Institute has been used. It may also be mentioned that anti-strangles serum has been used fairly extensively in dog distemper. The serum of Dassonville and de Wissocqu (Serum D.W.) was originally an anti-strangles serum and this has been employed extensively on the Continent of Europe in the treatment of distemper.

(4) Serum prepared from horses by immunising against *B. bronchisepticus.*

It is believed that the primary infective agent in dog distemper is the virus first described by Carré and on that account it is considered that these antibacterial sera are of quite limited utility. If it is known that *B. bronchisepticus,* for example, is complicating a case of distemper, the administration of an appropriate antiserum is perfectly rational, but the injection of such a serum into every case of distemper can lead only to disappointment.

In addition to these heterologous sera there are three homologous sera on the market now which are designed to antagonize the virus infection, and they are as follows:

(1) Ashe Lockhart, Ray and Barbee (1925) announced the production of a homologous antidistemper preparation (later stated to be a serum) but they gave no information regarding the technique of its manufacture or standardization. This serum, combined with an antigen (the nature of which was not disclosed) was found by them to give a durable immunity. This double inoculation method of protection was tested later by Skidmore and Buckley (1926) who did not secure such favorable results as the originators of the method.

(2) The homologous serum of the Cutter Laboratories, U. S. A., is made by hyperimmunizing dogs, but there is no published description of the method of its manufacture nor any account of a method of standardization. The manufacturers state that a single dose of from 10cc to 30cc of serum will give passive immunity and that the serum should prove useful in the treatment of early cases.

(3) Nusshag and Stecher (1929) published an account of an antidistemper serum prepared in dogs by hyperimmunizing with virus and certain unspecified bacterial antigens. No precise record of the hyperimmunizing course for the manufacture of the serum is published and

no evidence of standardization is given save this, that a dose of 10cc of serum should protect a susceptible dog against distemper infection for a time, and larger doses than this—repeated if necessary—should prove valuable in the treatment of the disease.

It may be noted that Nusshag and Stecher have attempted to combine an antiviral serum with an antibacterial so as to improve the product for treatment.

In no case is one told exactly how the serum is prepared and what steps, if any, are taken to standardize the product with a view to issuing a serum of high and known potency.* It is clear that unless an alleged hyperimmune serum can be standardized, its protective value will necessarily be variable and at times inferior. A few experiments have been performed to test these three sera, but the results indicate that none of the samples tested was of high potency.

Dunkin and Laidlaw (1931.2) failed to obtain great assistance from the work of others in their search for the best method of producing hyperimmune serum of good quality and after many disappointments they secured some samples of serum, the potency of which convinced them that it was possible to prepare serum with very valuable protective powers. They did not find it an easy matter, however, to determine what was the best method to adopt in order to secure serum of good quality at will, nor was it obvious what was the most economical and best method of testing and standardizing the serum after it had been secured. These two points are really intimately connected.

These authors have recently described these points and the difficulties which they encountered and state that it is possible to prepare potent serum regularly and guarantee by certain tests that the product shall reach a certain standard of efficiency before issue.

The method of manufacture may just be outlined. Dogs which have been immunized against distemper or that have recovered from that disease are kept for at least a month without treatment. A large dose of potent virus (20cc of a 20% suspension of infective spleen and lymphatic glands) is injected subcutaneously into the dog on two successive days. The response to the injections of virus is followed, by means of a serological reaction, on samples of blood drawn from the saphena vein. When the response appears to have reached a maximum the dogs are bled out under full anesthesia and the serum collected in the usual manner. The rise of antibody content is usually very rapid under these conditions and serum may frequently be harvested within a week of the hyperimmunizing injections. The serological test depends on complement fixation when virus, antiserum, and complement are incubated together. There is no proof that the complement fixing antibody and the protective antibody *always* go hand in hand, but it has been found that the serological reaction is a very useful guide in serum work and "so far every serum which was rich in complement fixing properties was also potent in protective powers." In every case the serum is also tested upon susceptible dogs before issue is permitted. (Laidlaw and Dunkin 1931.3.)

One method which has been used for testing sera also illustrates one of the utilities of serum in practice: three puppies, preferably of the same litter and about three months of age, are selected and one of the group receives subcutaneously a small dose of the serum to be tested on one side of the body, and a surely infecting dose of virus on the other side. The second puppy receives two to four times this dose of serum and the same dose of virus, and the third, being the control, receives virus only. In the experiments which have been conducted at Mill Hill the result, in the case of

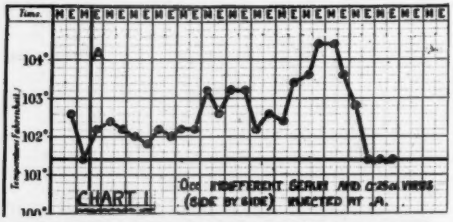
* Probably not all American publications on this subject are available to the author. The facts are, all American anti-distemper sera are prepared under a license from the Federal Bureau of Animal Industry and the methods and details of their manufacture are on file with the Bureau. They are not secret preparations in the usual acceptance of that term. The author's statement as to standardization of the American products is surprising. The American anti-distemper sera are standardized according to methods on file with the B. A. I. These methods have been published frequently. The tests approximate the tests given anti-hog cholera serum, which is the severest test given any biological product for human or veterinary use.—Editor.

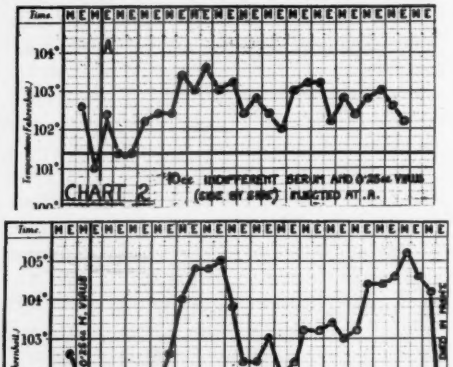
potent serum, has been usually as follows: the puppy receiving the larger dose of serum is completely protected; the one receiving the small dose may show a small temperature disturbance on the third or fourth day but will suffer no ill-effects, and the distemper attack will be suppressed. The control which received virus only develops a typical distemper attack. These results will be obtained with certainty only when one employs (1) puppies of known susceptibility; (2) serum of high potency; and (3) virus which is living and potent.

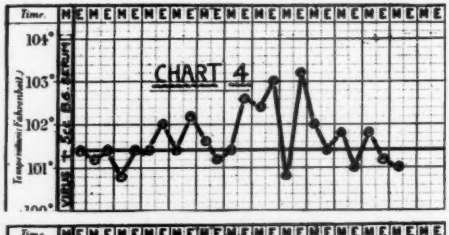
That this is essential there can be no doubt and the practical results of the simultaneous serum-virus method when serum of indifferent quality is used will be seen in Charts 1, 2, and 3. It will be observed that in the case of each serum-treated dog (1 and 2) there was considerable febrile disturbance, one of them reaching 104° F. for a day and showing also certain clinical symptoms as well. Both the serum-treated dogs recovered, however, whereas the control dog died (3).

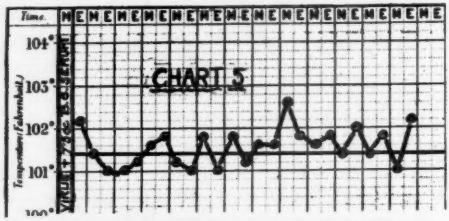
Evidence was obtained in a few cases that the serum obtained from some dogs which had recovered from an attack, but which had received no reinforcing dose of virus, would protect when a dose of 10cc was injected.

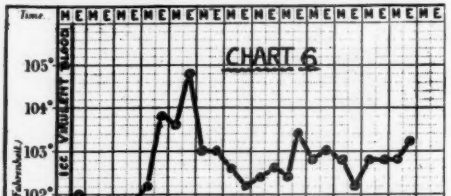
The many experiments which have











Comparing the results of various sera, Charts 4 and 5 show the effect of using a serum of higher potency. In the case of Chart 4, the puppy received 5cc of B.6 serum on one side and virus on the other, and it will be seen that there was a late mild febrile response. In Chart 5 is seen the result of giving 7.5cc of the same serum under exactly similar conditions. Chart 6 indicates the temperature response for the first twelve days shown by the control puppy of this series. He developed a typical attack of distemper and 26 days after receiving the virus he developed fits and had to be destroyed. Both puppies whose reactions to the serum-virus simultaneous inoculations are seen on Charts 4 and 5, proved to be immune when tested two months later.

been conducted at Mill Hill with different batches of serum of good potency are convincing proof that simultaneous, side by side inoculation of serum and virus is a safe procedure and from the analogous cases of immunization against rinderpest and hog cholera it is to be expected that the operation would lead to a durable immunity.

This point being of considerable importance has already been tested and it has been found that puppies tested one and two months after immunizing by this method with relatively large doses of virus are still immune. It is indeed highly probable that immunity so conferred is life long. Experiments have shown that the passive immunity conferred by the injection of serum alone is of only a few days' duration and therefore the immunity after two months must be an active one elicited by the injection of living virus. These cases are, in fact, very similar to those which in the first stages of the Mill Hill work received vaccine and virus. Vaccines stimulated the recipient to form a small amount of antibody and the living virus converted the resistant state thus induced into solid and durable immunity. In the cases under consideration, prepared antibody is presented to the dog from the start and he is resistant from the outset. Living virus consolidates the resistance and converts it into immunity. There is no evidence as yet that the immunity will last for life, but it is expected that this will prove to be the case.

A point of considerable theoretical interest and of some practical importance is the length of time that must elapse before a treated dog develops sufficient active immunity to protect him against accidental infection. Injections of large doses of virus at various time intervals after the double protective inoculation show that the immunity is only solid after three weeks. This test is a severe one as the test dose of virus is almost certainly far in excess of the amount that can be picked up in a natural infection and it is therefore highly probable that in field practice an adequate immunity is established in a shorter time.

Apart from numerous experiments carried out at the laboratories a considerable amount of serum has been sent to veterinary practitioners (43 in all) but only 767 dogs and hounds have received the full treatment.

The immediate results of the double inoculation in the field are highly gratifying. One or two cases have been reported where the temperature has risen very high and it has been considered advisable to give an extra dose of serum. In no case, however has there been serious illness or death.

One advantage of the method under consideration is that animals which are unusually sensitive and show distinct reaction to the virus may be given a further and larger dose of serum at the time when a high temperature is registered, and in this way the attack may be cut short. The temperature will fall within a few hours and the puppy show no ill-effects.

The administration of serum in the incubation period of the disease was also studied as a means of testing serum and because injection at this time was of great practical importance. The effect of serum given both two and three days after the injection of virus has been tried. The results have been uniformly encouraging with good serum and demonstrate that a high degree of protection may be afforded by adopting this procedure.

Possible Complications Arising During the Process of Inoculation

These can be placed conveniently under three headings:

(1) Unusually sensitive patients which develop an unlooked for febrile response to the virus. It may be said that such cases have so far caused very little worry and that a double dose, that is 10cc of serum, given at once, corrected the position and by increasing the antibody content in the patient allowed the immunization process to pass off without further trouble.

(2) Puppies unwittingly inoculated when in the incubation period of the disease. It is quite possible that animals coming under this heading form quite a formidable class, for it is not always easy or even possible to obtain an accurate history of the patient for a week or so prior to the injection period. In view, therefore, of the doubt which must exist in the minds of both owner and veterinarian, it becomes more than ever desirable, if not actually necessary, to arrange for a record of bi-daily temperatures after the inoculations have taken place, so that the case may be quickly and properly treated if it becomes necessary.

(3) Puppies suffering from some febrile condition which is not suspected or reported at the time of inoculation.

It is quite possible, of course, that the presence of some unsuspected and possibly dormant condition at the time of inoculation might, by reducing bodily resistance, allow the virus to get the upper hand, but here again a further dose of serum given later should assist in overcoming the virus infection.

There is no doubt that the possession of a supply of potent serum gives the operator a sense of security in the earliest stages of the distemper attack.

Treatment

The treatment of the established disease is a matter which continues to give veterinarians worry and it therefore became a matter of the first importance that the value of hyperimmune serum in treatment should be ascertained. The statement which has been made that serum given in the incubation period appears to have a beneficial effect, indicates that serum given later, when symptoms are fully established, should be of value. It is clear, however, that an antiviral serum to be of any value in treatment must be very potent and must be given early for it has to be remembered that a millionth part of a gram of infective spleen may infect a susceptible dog and at the height of this animal's first febrile reaction, 1/1,000cc of blood may infect another dog. Thus the virus has multiplied a million-fold in four or five days and in the later stages of the disease the virus has multiplied still further, probably a billion times. Every hour is therefore of importance after infection has occurred and if treatment is possible only in the later stages it is essential that large doses of potent serum should be given immediately. Even under favorable conditions large doses of serum are necessary.

In view of the inconvenience of injecting large doses of serum Laidlaw and Dunkin (3) state that they have secured a still more potent product by recognized serum concentration methods and they have found it possible to secure a solution five times as potent as their standard serum. They have described this solution as concentrated antibody. Many cases have been treated with this substance with encouraging results but the length of time which has elapsed since the commencement of this form of treatment is too short and the number of cases too small to allow of a final statement being made concerning it, but it is evident that concentrated antibody is an exceedingly valuable remedy in the treatment of the established disease.

It is clear that there must be limits to this method of treatment and it may be added that as further reports come to hand there is additional evidence of the efficiency of this form of treatment, but it is clear that the success or failure, apart from depending on the potency of the product used, will also depend very largely on the type of case treated and particularly the length of time the disease has been in existence. It is unfair to expect good results from the treatment of distemper cases complicated with bacillary infections or of cases of distemper encephalitis. In the former case it is probable that the appropriate heterologous sera originally referred to might prove to be valuable. The main difficulty, however, in this case is to know which of the many possible kinds of bacteria is giving trouble.

Cases of nerve complications will probably be difficult to treat, for there is much evidence to show that the central nervous system is isolated from the rest of the body to such a degree that complex substances like serum protein cannot gain access to the nerve cells. It may thus prove to be the case that serum is useless for distemper encephalitis when given by the ordinary route. Intrathecal injections might be attempted, but on this point there is no definite information.

Conclusions

(1) Serum and virus, side to side, simultaneous inoculations promise well for the protection of susceptible dogs. The duration of the immunity thus secured is, as yet, unknown, but it is considered that it should be as good as that resultant from vaccine followed by virus.

(2) Specific treatment of distemper by antiserum (at any rate in the early stages of the disease) has come forward as a practical measure.

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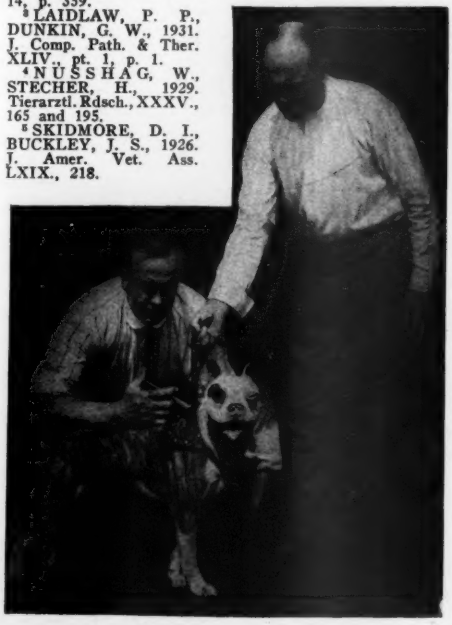


PYOMETRA IN SPAYED BITCH WITH ABDOMINAL FISTULA

History.—Sealyham Terrier, 1½ years old, spayed about eight months ago. The owner reported bitch was in season twice and bred each time; also that the abdominal wound made in spaying had never healed completely. Otherwise, the dog was apparently well except that she was slightly emaciated and enlarged in the abdomen as if pregnant.

Symptoms.—Examination revealed a fistulous tract leading apparently into abdomen which discharged diseased material and pus. Upon abdominal examination, a large mass, soft in parts and quite firm in others, could be palpated.

I advised a laparotomy to correct the fistula and at same time to determine and correct the internal trouble.

The dog was prepared and given anesthesia for the operation. Going through the abdominal wall we found the ovarian end of one horn of the uterus adhered between the abdominal wall muscles forming the fistula. The spleen and omentum were also adherent at this place, forming the large hard mass felt in the examination of the abdomen before the operation. I broke down the adhesions and separated the spleen from the mass. This allowed us to explore the abdomen where we found the other horn of the uterus, measuring about ten to twelve inches in length and about one and one-half to two and one-half inches in diameter and filled with about one pint of pus. The uterus was adherent at the ovarian end to the region near the kidney. The other horn was about two or three inches long, the thickness of a pencil and adhered as stated before in the abdominal muscles, causing a fistula.

Apparently the ovaries only had been removed when the dog was originally spayed.

The infected uterus and horns were removed, all possible adhesions broken down and wound sutured as in any operation.

The dog was discharged from our hospital in ten days, following the operation, apparently well.

C. P. Zepp.

New York City.

Keratitis

By H. J. MILKS, Ithaca, New York

KERATITIS is an important subject for the Small Animal Practitioner. It is a common condition of dogs, and especially of certain breeds which are characterized by prominent or pop eyes, such as the Pekingese, Bostons, etc. It is occasionally encountered in cats but not so frequently as in dogs.

Diagnosis

Many things must be considered in making the diagnosis of keratitis. First the disease must be located in the cornea. Then it must be decided whether the disease is superficial or deep. In diagnosing inflammations of the cornea, two of its most prominent normal characteristics must be taken into consideration. These are lustre and transparency. The epithelium covering the cornea forms an excellent reflecting surface that might be compared to our best mirrors. Its transparency needs no comment. There are no inflammations of the organ in which these characteristics are not changed. Since there are no blood vessels in the cornea and it is not elastic, the ordinary signs of inflammation, redness, swelling, etc., are wanting. Cloudiness of the parenchyma and dullness of the surface are signs of recent inflammatory infiltration. Upon close inspection of one of these dull corneas, especially if it is viewed through a hand lens, it will be noticed that the cornea has lost its smoothness. It appears roughened and uneven, as though it had been picked with numerous needles, the so-called "stippled surface." This stippled appearance is common to all corneal inflammations. A scar may sometimes appear stippled and cause some confusion, but it can ordinarily be differentiated by its color. There is always a yellowish tinge to a gray infiltration, while scar tissue is more bluish or white. A congestion of the blood vessels of the adjacent tissues also usually accompanies inflammations of the cornea but is sometimes lacking.

Occasionally one will confuse an opacity of the cornea with that of the lens or true cataract. I have known of this mistake, especially with central circumscribed opacities of the cornea. There are several ways in which the position of these opacities may be determined. Inspection from the side is the simplest and is very certain. It consists of looking across the eye from the external angle of the lids. This easily locates the position of any opacity anterior to the lens. Of course, if an opacity is seen from the front and is invisible from the side, it is probably in the lens.

After the disease has been definitely located in the cornea, it is necessary to decide whether the inflammation is superficial or deep. When the corneal surface shows no change except the stippled appearance, it may be impossible to determine the location of the inflammation by inspection even with the lens. In general, superficial inflammations are more or less sharply defined and have the appearance of hazy spots of irregular form. The superficial form usually occurs in circumscribed areas. Near these areas the cornea is normal or shows only slight changes due entirely to the changes in the diseased area. In deep keratitis the areas are more extensive, and frequently the whole cornea is affected. A precipitate on the posterior wall is always a sign of deep keratitis. A persistent keratitis with no loss of substance may generally be regarded as deep. The blood vessels also play an important part in determining the position of the inflammation, since the presence of blood vessels in the cornea always means an abnormal condition. These vessels may be superficial or deep. The superficial vessels are arborescent, tortuous, bright red, easily seen and can be traced to their origin in the conjunctiva. The deep vessels originate in the sclera and extend straight into the cornea. They are straight, dark in color, and have few branches. They are less distinctly seen than the superficial because they are often covered by a densely infiltrated cornea. As a rule, superficial vessels indicate superficial inflammation and deep ones parenchymatous, but this rule is

not absolute as superficial vessels sometimes accompany deep inflammations. Deep keratitis is usually caused by general or systematic infection while the superficial form may be due to extraneous influences.

Although there are several forms of keratitis usually described, it seems well to make a division of (1) non-suppurative and (2) suppurative, and to subdivide these slightly. Under non-suppurative are included superficial keratitis, pannus, vesicular keratitis, pigmented keratitis, superficial punctate, keratitis, and parenchymatous keratitis. Under suppurative, ulcerative keratitis, abscesses, and other conditions which accompany or are sequels to the disease.

Non Suppurative Keratitis

Superficial keratitis is an inflammation of the epithelial covering of the cornea and the superficial layers of the parenchyma. It is manifested as a bluish white cloudiness, as a rule localized, but not always. It is accompanied by lacrimation and photophobia. A slight desquamation may take place but this is so slight that special measures must be taken to recognize it, although it may be outlined with a drop fluorescein solution. Resorption usually takes place within a few days, leaving no trace of the disease.

Keratitis punctata superficialis or Faceted keratitis is often seen in certain breeds of dogs, especially the Pekingese. It is characterized by more or less cloudiness in the midst of which small areas may be made out by close examination. These areas or spots are opaque, white, grey, or even yellowish in color. They are located beneath Bowman's membrane. The epithelium over the spots may be slightly elevated. Occasionally ulceration of these areas occurs. Between the spots are portions of clear tissue which gives the cornea a faceted appearance. This clear tissue is sometimes diagnosed as ulcerous but in reality is sound tissue between the diseased spots. This disease may affect both eyes and, by Nicholas is considered as chronic. The attacks are recurrent or tend to be periodic, the symptoms changing somewhat but not entirely disappearing between the attacks.

Interstitial keratitis, Parenchymatous keratitis, is an inflammation of the deeper layers of the cornea. It is characterized by deep infiltration accompanied by increased vascularity of the sclera. Irido-cyclitis is a common complication. There is little exact knowledge concerning its causes; in man, syphilis is the usual cause. This disease is commonly seen in distemper of dogs; we have seen cases in which this variety of keratitis and an increased temperature were the only evidences of distemper. The disease may spread from an iritis and by some it is thought that it may be caused by injuries. The greater percentage of cases, however, are caused by internal disease.

Symptoms: The cornea becomes translucent or turbid, grey or yellowish in color and often resembles ground glass in appearance. When examined under a strong light or a hand lens, the cornea is stippled and blood vessels are seen to run from the periphery to the center, forming a zone or circle around the corneal limbus. These vessels keep the same depth in the cornea and always push toward the center, reducing the diameter of the circle and finally form a ring which, at first sight, has no connection with the periphery. Upon closer observation, however, it will be seen that these vessels or this ring is bound to the periphery by ramifying vessels which are distinctly separated from each other. Lacrimation, and other evidence of pain, and photophobia are generally present although we have seen cases in which there were absolutely no subjective symptoms whatever. Ulceration does not usually follow. The course runs from several days to weeks and even months; there is a tendency to relapse, and permanent turbidity may result.

Pigmented keratitis is a chronic disease due to inflammatory or degenerative changes in the cornea and is characterized by a brownish or black deposit of pigment within the corneal layers. Some breeds such as the Pekingese, Poodles, and Bostons, are said to be common sufferers. This disease is essentially a deep vascular or interstitial keratitis accompanied by a deposit of melanin or other pigment within the cornea. It is usually but not always a disease of old animals. The prognosis is unfavorable.

Little is known of its etiology. The dis-

ease appears to attack those animals in which there is much normal pigment in the conjunctiva and sclera near the corneal limbus. It frequently follows ulcerative keratitis. Many cases are diagnosed as argyrism due to deposits of silver from the treatment of ulcerative keratitis with silver salts and yet it follows when no silver salt has been used. Sometimes it is associated with eczema of the lids. Whether or not there is any connection between these conditions, or whether or not they are simply coincidental, is not definitely known. Pigmented keratitis is usually a primary condition affecting but one portion of the cornea, but gradually advancing in a triangular or fan shaped manner toward the center of the organ.

Symptoms: The ordinary symptoms of inflammation of the eye are absent and in most cases the pigmentation is well under way before it is noticed by the owner. The pigmentation is easily seen when observed laterally or obliquely with the aid of a strong light or with the animal facing a window.

The treatment is not specific. If the cause can be found, internal treatment would be indicated, but usually no treatment is in any way effective.

Treatment of Non-Suppurative Keratitis. The routine treatment of non-suppurative keratitis consists in the use of warm, non-irritating, antiseptic solutions. According to most authorities the milder the better. Heroic measures are not indicated in the ordinary forms of superficial keratitis and their employment leads to disaster. The application of hot packs, two or three times a day and the installation of such agents as 2—4% solution of boric acid, 1% borax, 1—5,000 metaphen, 1 or 2% mercurophen, or mercurochrome, or one of the organic silver preparations, chinosol, etc., usually effects a cure within a few days. Mild ointments may be substituted for the solutions if they are preferred. A 1% solution of atropine is useful in severe cases, both to relieve pain and lessen any tendency to iritis. Pain and photophobia may be relieved by a 1% solution of cocaine hydrochloride but the continuous use of this drug is generally believed to be harmful. Quinine and urea hydrochloride (1%) appears to work well as a substitute for cocaine. It does not produce its action so rapidly as cocaine but it is more persistent, lasting, some claim, up to 24 hours. From our experience it seems best to instill it 2 or 3 times a day. After the acute symptoms have subsided, calomel or iodoform, in fine powder, or in an ointment may be useful, or the cornea may be massaged with a weak (1 or 2%) yellow oxide or mercury ointment. Dionin is often useful to aid in the absorption of the opacity. It may be dusted upon the cornea in pure form or applied in a 5 to 10% solution or ointment. This drug causes an edema of the conjunctiva and is thought to promote the flow of lymph through the cornea, in this way promoting the absorption of the exudate. Dionin is also useful to relieve deep seated ocular pain. The eye soon acquires a tolerance for this drug, hence little will be accomplished from its use for more than three or four days to a week. This tolerance soon wears off and the drug may again be employed after a few days intermission.

Pannus

Pannus is a vascular growth of connective tissue upon the superficial layers of the cornea. It may be between the corneal epithelium and Bowman's capsule. It begins with keratitis in which areas become clouded and infiltrated with superficial tortuous vessels. These areas are located upon the surface of the cornea, are raised somewhat and upon superficial examination appear like a film which might be washed off easily. Upon closer examination, it will be seen that the opacity is traversed by relatively large tortuous, branching vessels, which may be traced through the corneal scleral limbus to the conjunctiva. These vessels are largest at the periphery and penetrate toward the center of the cornea. If the cause has disappeared, their new tissue becomes organized and takes on a cicatritial appearance, the vessels becoming fewer in number. Pannus crassus is a term used to designate a thick dense lesion, Pannus tenuis, to one less dense and thinner. Pannus is not a very common disease of dogs but is occasionally seen.

Causes. The cause is not definitely known

but it is generally believed to be due to some chronic irritation such as entropion or follicular conjunctivitis. In our experience, we have never encountered a case of pannus in entropion. We have seen cases of pannus in which there was also a follicular conjunctivitis and have frequently seen enlarged follicles on the back of the third lid. Unfortunately, our treatment for follicular conjunctivitis, even the removal of the membrana nictitans, has had little influence upon the condition of the pannus.

Prognosis depends upon the corneal infiltration and destruction of the epithelium. Pannus is frequently followed by opacities and yet treatment will often restore an eye to a fairly serviceable condition.

Treatment. The early treatment consists of massage with a weak yellow oxide of mercury ointment and the use of astringents. Atropine is generally recommended during the early stages. The application of dionin appears to be of considerable benefit as is an ointment of copper sulphate (1—60), or lightly cauterizing the inside of the lids with copper sulphate crystals, after anesthetizing the eye. Of course, the conjunctival sac should be thoroughly washed out after the application of the caustic. The cauterization should be repeated every other day or two or three times a week, depending upon the appearance of the conjunctival surface.

If very vascular, peritomy sometimes works well but according to Gray is not usually successful. If there is much cicatricial tissue it may be removed with a knife or curette following this with massage with yellow oxide of mercury ointment (5%) and the application of dionin.

Suppurative or Ulcerative Keratitis

Ulcerative keratitis is a common disease of dogs. It may be primary, in which case it begins in the cornea from abscess, wounds, or it may be secondary to conjunctivitis. It may be classified also as endogenous, due to infections carried through the blood and lymph, or exogenous when due to local influences, but of whatever nature they lead to the same thing and erosion or ulceration is the result. In some cases the ulcers follow a diffuse keratitis, and involve a large part of the cornea and in others they remain localized and appear as though a small amount of tissue had been gouged out of the cornea. After the ulcer has formed it may be progressive, if it is still active, or regressive, if there is a tendency to cicatrize. In this stage it is also known as a clean ulcer. The healing process is accompanied by the development in the cornea of long, flexuous, red vessels, reaching from the ulcer to the sclero corneal limbus. Cicatrization always takes place by means of opaque tissue on a level with the corneal struma. The epithelial layer is entirely regenerated by proliferation of its margins and in the end completely covers the newly formed tissue. If entirely filled up, the cicatrix is on a level with the rest of the cornea and can be recognized by its opacity and irregular surface but if not completely filled, a flat faceted place remains. Occasionally there

Hydrophthalmus and keratitis of right eye

is an excess of granulating tissue which more than fills the area and bulges forward from the cornea. In some cases the scar tissue is too weak to withstand the intraocular pressure and bulges forward from the rest of the cornea—"ectasic cicatrix."

As the ulcer progresses it may extend into the depths of the cornea and destroy its whole thickness down to Descemet's membrane. This may withstand the intraocular pressure but more often yields and we get a hernia of the membrane or a keratocele. As a rule, however, this membrane breaks under the intraocular pressure with con-

sequences which will be discussed later. As long as any of the corneal layers remain, the floor of the ulcer will be opaque, but when only the membrane of Descemet is left the edges will be opaque but the floor clear.

Prognosis. This depends upon the extent and condition of the ulcer and the age and general health of the animals. In general, aged, diseased dogs are less favorable patients than young or healthy animals. Prognosis also depends somewhat upon the early recognition of the ulcer. As a rule the earlier recognized and treated, the better the prognosis. Hence all cases of keratitis should be examined carefully for loss of tissue. In cases of doubt, a drop of fluorescein solution (Fluorescein 1%, Sodium Bicarbonate 2.5%) dropped onto the eye and immediately washed off will aid in the detection of the ulcer. This preparation stains any denuded area a bright green but does not affect sound tissue. Eosin may be used instead of the fluorescein but stains the denuded area red. While making the examination one should note the condition of the ulcer, that is, whether it is in an active or healing stage. An active ulcer is characterized by ragged edges, convex grayish base and general cloudiness and is accompanied by other local inflammatory disturbances. If healing, the edges of the ulcer are rounded, smooth, and clear. The cloudiness is clearing and the acute symptoms subsiding. A hand lens is valuable in determining the condition of the ulcer.

Treatment. In simple ulcers the *cul de sac* of the conjunctiva should be irrigated thoroughly with one of the mild antiseptics mentioned under non-suppurative keratitis. Pain and photophobia may also be handled similarly. These simple ulcers often heal promptly under atropine and boric acid solution or other mild antiseptic. All solutions should be sterile to avoid infecting an otherwise simple ulcer. If accompanied with conjunctivitis this disease must be treated also. We have found it necessary in some cases to cauterize before we could arrest the progress of the ulcer. The cauterization is performed as follows: First anesthetize the eye with Butyn or Cocaine solution and follow this with the fluorescein solution to outline the ulcer. Then apply strong phenol on a probe, using care to shake off any drops that may have accumulated on its lower end and would spread all over the cornea. Since phenol burns the tissue white, the progress of the cauterization shows up nicely upon the green background of the stained ulcer. When all the green tissue has been covered, the entire ulcer has been cauterized and unless one has strayed off the green tissue, no sound cornea has been burned.

It is impossible to determine whether or not there is any benefit from the fluorescein solution beyond outlining the ulcer. Our experience gives us the impression that those cases upon which it is used every time the case is dressed do much better than those upon which it is not used. Its daily use certainly shows how things are going. As the stained area increases or decreases we know whether the ulcer is progressing or healing and when finally the lesion does not stain we know that the danger is over. After the acute symptoms have subsided or from the beginning in some cases in which the ulcer has been torpid, some stimulation is needed. For this purpose yellow oxide of mercury ointment, 2 to 5%, iodoform or calomel dusted on the cornea or in the ointment do well. The eye should be well irrigated with a mild antiseptic before applying the powder or ointment.

Deep and sloughing ulcers. Hot fomentations and irrigation with the agents mentioned under simple ulcers are always indicated. Atropin is especially useful to prevent iritis and lessen pain. Some recommend a weak solution of eserine (¼-1 gr. to the ounce). It is claimed that this drug stops the migration of white cells or promotes absorption through dilation of the ciliary vessels. Like all other myotics, eserine lowers intraocular pressure and thus lessens tendency to rupture of the cornea. Other authorities are of the opinion that atropine is invariably the better drug.

If the ulcer still progresses in spite of the milder measures, as is often the case, more heroic treatment is necessary. It may be curetted with a sharp knife or spoon until all necrotic material is removed and

the edges then touched with a mild caustic. Strong chemicals may be applied directly to the ulcer as described under simple ulcers. Many chemicals may be used, silver nitrate, 5-10%, or in stick, liquid phenol 95%, tincture of iodine, formaldehyde 1-50% and many others. The actual cautery is also recommended. Of course the eye is anesthetized before such treatment is employed.

Dionin is often of distinct service. It acts not only as a lymphagogue and an analgesic, but also seems to be of distinct benefit in stimulating regeneration.

In cases in which perforation seems certain in spite of treatment, a dry pack should be applied and kept in position except when dressing. These cases require great care in handling. Any pressure upon the eye ball is liable to rupture it. Therefore in forcing the lids open one should be careful to put any pressure upon the bony parts above and below the eye. If the floor of the ulcer bulges, it is well to relieve the intraocular pressure by paracentesis of the cornea. In small round ulcers it is customary to do this through the floor of the ulcer, but when the ulcer is large and irregular perhaps the regular operation will do better, and yet it has always been our custom to puncture through the floors of even these. Sometimes it is necessary to repeat the operation upon several successive days. The escape of the aqueous lowers pressure, relieves pain, favors healing and tends to prevent perforation of the cornea with its attendant sequelae.

Perforation. It frequently happens that the cornea is ruptured with the escape of the aqueous and prolapse of the iris. In other instances, and especially if the iris has been contracted with atropin, only the membrane of Descemet protrudes, showing a bulging of a thin transparent membrane. In such cases puncture the membrane and draw off considerable of the aqueous. With the diminished pressure the membrane will often return to its natural position. The cornea heals very slowly if at all as long as Descemet's membrane protrudes through it. If there is complete perforation with protrusion of the iris, atropine or eserine, according as to whether the rupture is central or peripheral, should be pushed and at the same time efforts made to return the iris with a probe. If the iris cannot be returned in this manner grasp it with forceps, pull out and remove with scissors as close to the cornea as possible. If the perforation has been large, a staphyloma will result in spite of any treatment.

In cases in which there is no protrusion of the iris, the opening in the cornea may be closed by granulating tissue which may be so great as to grow beyond the level of the cornea. This condition is often spoken of as a staphyloma but is in reality granulating corneal tissue. The excess tissue can be removed with a knife or scissors. Small excess granulations may be cauterized.

Sequelae. The most common sequela is the cicatrix, or scar shown by a dense white spot. The thicker and whiter these spots, the less they will respond to treatment but much benefit will often follow from massage with a strong (3-5%) yellow oxide of mercury or other stimulating ointment. The massage should consist of lateral, vertical and radial movements, completed by circular ones over the closed lids following the application of the ointment, and lasting from one to two minutes. We have had good results from daily alternating dionin with the above ointments, or making the change from dionin to the ointment every few days. It is not possible to entirely clear up all these scars but it is possible in most cases to save the eye with little disfigurement.

Staphyloma. The distension of a cicatrix to which the iris is attached is called a staphyloma. It is due to the fact that the scar tissue does not stand the intraocular pressure and consequently it is pushed forward. The treatment is preventive and has already been described. If the case is more severe than to just allow the prolapse of the iris, no treatment will avail and an enucleation is indicated.

Hypopyon. This consists of a collection of pus in the anterior chamber. It does not come from the cornea but from the vessels about the periphery of the cornea and ciliary body and iris. The only treatment is to evacuate the pus by paraceptesis of the cornea.

Gastro-Intestinal Disturbances of Small Animals Due to Foreign Bodies

By H. E. KINGMAN, Fort Collins, Colorado

FOREIGN bodies are a common cause of gastro-intestinal disturbances in small animals. The veterinarian must keep this fact in mind always when dealing with any gastro-intestinal disease.

The diagnosis or elimination of the possibility of foreign bodies in the gastro-intestinal tract may or may not be a simple matter, since the variety of objects that may gain entrance and eventually cause trouble is responsible for a complicated chain of symptoms. The history associated with the appearance of such cases is well known to all veterinarians, as well as the objects that are commonly encountered.

Sponges are easily swallowed by dogs but after the digestion of the material (usually fatty) in which the sponge is soaked, it lies in the stomach and cannot be passed into the intestines nor expelled by vomition. This occurs most frequently in puppies, since they are prone to chew and to swallow things that more mature dogs would refuse.

The symptoms produced by the sponge are those that are encountered in other stages of chronic or even acute indigestion. That is, the puppy suddenly loses its appetite, vomits frequently, drinks large quantities of water and sooner or later throws it up again. It no longer has the healthy, vigorous appearance of puppyhood and loses interest in play. The coat becomes dry and unthrifty, much the same as it might in the case of parasitism, and further, due to lowered resistance, it is a fit subject for infectious diseases, such as distemper, which may come on at the same time and serves to complicate the case and confuse the diagnostician. Reactions on the part of the mucous membrane of the eye and respiratory tract occur in chronic gastro-intestinal catarrh, much the same as in the presence of many infectious diseases. The temperature, however, remains comparatively low. Palpation of the abdominal cavity and its content is negative so far as foreign body or other obstruction is concerned.

Gastro-intestinal lavage and the use of cathartics and emetics may, and usually does, fail to dislodge the sponge from the stomach and the condition is usually diagnosed as distemper or black tongue or some other gastro-intestinal disturbance.

There remain, however, three factors that have a definite bearing upon the diagnosis of such a case: (1) History, (2) Fluoroscopic examination, and (3) Laparotomy.

In the absence of a definite history indicating the swallowing of the sponge, or the suspicion on the part of the owner that the dog may have had access to such a thing, the veterinarian is deprived of a very important aid in arriving at an accurate diagnosis.

The most valuable agent to which the veterinarian has access in the diagnosis of gastro-intestinal obstruction is the fluoroscope or the radiograph following a bismuth or barium meal. This requires considerable experience and fairly good equipment. The bismuth or barium accumulates throughout the sponge and makes a fairly clear picture that certainly would not be present in the empty stomach and aids perhaps more than any other method in arriving at a definite diagnosis that otherwise might be found impossible.

The third method of diagnosis lies in an exploratory operation (laparotomy) which, of course, has its disadvantages, because if one fails to find an object of any kind then he is faced with the embarrassment of having done an operation from which no possible good can come, except being able to eliminate foreign body or other obstruction from consideration. It is, however, a procedure to be adopted in many instances where the diagnosis otherwise is obscured.

Rag-dolls, golf balls, marbles, coins and smooth objects produce much the same syndrome as a sponge in the stomach. The condition is usually not very acute, the case may not be presented for a week or more following the first appearance of the symptoms.

If the patient is young, it becomes necessary to differentiate between foreign bodies in the stomach and incipient distemper. The absence of fever in the former and the early appearance or involvement of conjunctiva and other mucous membranes, as well as the rapid course of the disease leaves one clear field in the diagnosis distemper. The absence of distemper leaves one still with the possibility of foreign bodies when gastric disturbances appear.

The solid objects are more easily located than the soft ones, since palpation offers a possibility of locating the offending object. In the case of solid objects, the use of the fluoroscope leaves little doubt in the mind of the diagnostician relative to the presence or absence of a foreign object in the gastro-intestinal tract. We have found it best to examine the animal prior to the administration of the bismuth meal since such a meal tends to obscure certain solid objects that might be present. However, in the case of soft objects, such as a sponge or rag, the bismuth meal collects around the obstructions and tends to emphasize them and makes the diagnosis more clear than would otherwise be the case. Following such an examination, negative findings are sufficiently conclusive to warrant one to

A chart showing a few facts relative to diseases of the stomach, arranged in much the same order as one would review them during the study of a clinical case in which the trouble appeared to be located in the digestive tract.

Disease	T.	P.	R.	Etiology	Symptoms	Course	History
Gastritis, Acute.	103–106	Irregular	Disturbed	Distemper, typhus, foreign bodies, acids, alkalies, hot food, putrid meat, drugs, poisons.	Acute indigestion, vomiting, fetid breath, congested m.m., pain, arched back, depression.	Short	Recent occurence
Chronic.	n	n	n	Parasites, poor food, ill health, foreign bodies.	Vomiting, poor appetite, disturbed nutrition, diarrhea, coated tongue.	Long	Indefinite
Foreign bodies.	n	n	Variable	Sponges, rags, coin, golf balls, bones, needle, grass, worms, hair, glass.	Same as gastritis except that flouroscopic and digital examination reveals the presence of foreign b.	Usually Protracted	Sudden occurrence Play habits
Stomach, Dilation of. **Acute.**	n	Pounding	Quick, dysp.	Overloading, poor food.	Distention, haggard expression. Attempts to vomit, dysp., tympany. Distress.	Short	Sudden. Free access to food material
Chronic.	n	n	n	Stenosis, pyloris duodenum.	Same as for chronic gastritis, splashing, distention, tympany.	Protracted	Long Standing
Ulcer.	n	n	n		Indigestion, vomitus streaked with blood, chronic gastritis.	Exacerbations	Long standing
Typhus.	98–105	Disturbed	Low		Same as for acute gastritis, extreme depression, symmetrical buccal lesions, vomitus coffee colored.	Short	Nothing of diagnostic value
Torsion.	98	200	Dysp.	Violent exercise, up and down stairs.	Distention, dyspnea, cyanosis, pain, colic, attempts vomiting, head extended.	Short	Sudden occurrence
Rupture.	98	Weak	Slow	Accident.	Great depression.	Few hours	Accident, apomorphine

The following headings are omitted from this chart: pathology, prognosis, definition, and therapy.

proceed under the supposition that no foreign body of sufficient size to obstruct the gastro-intestinal tract is present. Then one can turn one's attention to other possible causes of the condition.

The ingestion of large amounts of bone is responsible for acute signs of distress and frequently death in a short time usually from rupture of the stomach. Sometimes rupture of the stomach occurs after the administration of apomorphine. Lavage in such cases is futile, emetics are contra-indicated, and gastrotomy is hopeless.

Sharp objects may puncture and cause peritonitis, or death from shock, although such cases are not frequent, nor have they been commonly reported. Needles and pins frequently lodge in the esophagus, while bones commonly pass as far as the anus and still fail to escape because of the reflex action when the sharp objects injure the mucous membrane of the region. On the other hand, if the animal strains to pass sharp pieces of bone, they may be pushed through, not only the mucous membrane, but even the skin of the perineum. For removal it is usually best to administer a general or caudal (epidural) anesthetic so that less injury will be done during the removal of the offending material.

The impaction of the bowel, particularly the descending colon and the rectum with masses of bone is a common thing in old dogs and becomes a chronic affair unless precaution is used in feeding.

It frequently becomes necessary to use oil enemas to break down the impacted mass or even bone forceps to reduce their shape and size. Following the removal of the bone and fecal material, one should give a high enema of bismuth and boric acid in oil.

When foreign bodies pass from the stomach into the intestine, the diagnosis becomes slightly less difficult.

While vomiting is still a constant symptom of foreign bodies in the intestine, they can be palpated usually.

Treatment.—Laparotomy followed by gastrotomy offers the only relief in most cases of foreign body in the stomach. Gastrotomy, while simple to perform, is a precarious operation. The prognosis must not be looked upon as favorable, nor should the operation be attempted except under the most favorable environment possible to provide. With all asepsis measures rigidly enforced, when the stomach is opened, the field may be contaminated by its contents and death result from peritonitis. It is urgently necessary to provide some means to prevent the spread of infection from the incision in the stomach. If possible, the portion of the stomach in which the foreign body has been retained should be clamped off by means of rubber covered forceps. This will in some measure prevent the escape of the fluid contents of

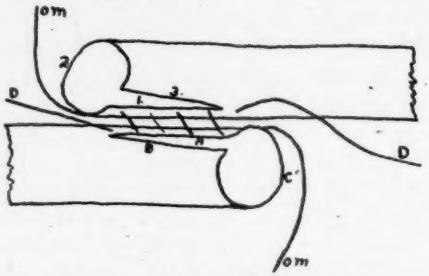


Fig. 1. Intestinal Anastomosis

the stomach, and the incised portion can be held elevated in such a way that the foreign body may be lifted up by means of forceps with the least of possible contamination of surrounding tissues. Prior to the opening of the stomach, sutures should be placed at the approximate commissures of the wound that is to be made, so that after the body has been removed the wound may be stretched in such a manner as to facilitate the most rapid and efficient suturing. And further that the wound may be elevated above the operative field in such a manner as to prevent any further escape of the fluid from the stomach. That is, these initial sutures serve as two handles, as it were, by which an assistant holds and manipulates the organ.

The wound is closed through the use of an atraumatic needle with small chromic gut about 0 or 00.

It is possible that further protection may be offered by stretching a piece of omentum

over the wound after it has been closed by means of sutures.

The prognosis is a little more favorable in the removal of foreign objects from the intestinal tract than from the stomach, since the handling of the bowel is the easier. However, when necrosis has occurred and resection of a portion of the intestine must be performed, the probable outcome is not altogether favorable. In practice it usually happens that the case is severely toxic before the operation is performed and the resistance of the patient is materially lowered. The outcome of such cases is usually a heavy mortality.

There are many methods of uniting the ends of the intestine following resection.

The one herein described gives opportunity for uniting bowels of different circumference and when completed does not narrow the lumen of the intestine.

Make incision (D in Fig. 1) lengthwise of the intestine equal in length to the circumference of the bowel, and close to the mesenteric attachment.

Unite sides 1 and A in Fig. 1 by means of Lembert suture leaving the ends free in order to complete the Lembert after the ends of the intestine have been closed by a Czerny suture.

Bring margines 1 and A, 2 and B, and 3 and C into apposition by means of Czerny. Cover the Czerny by a continuous Lembert.

Illustrative Cases

Foreign Body in the Stomach.—

Case No. 1.—A four-year-old Irish Water Spaniel, male, was brought to the hospital for treatment.

History.—Patient had had a cough for several days; no appetite; was an animal that continually played with rocks, golf balls, etc. Had been treated for tape worms sevveral months previously.

Symptoms.—Vomited grass and pieces of sharp bone; licked his "chops" as though suffering from nausea; drooled a thick saliva; eyes were listless. The tongue and lips were normal in color and there was no evidence of bad breath. Pulse and respiration were normal; the temperature was 101.4° F.

Fluoroscopic examination revealed the presence of a dense object, such as a stone, in the stomach, although its position was such as to lead one to wonder whether or not it had not passed out of the stomach into the intestine.

Treatment.—The patient was prepared for a gastrotomy operation by shaving large area on the ventral abdominal wall and painting it with iodine. A median incision was made and the stone was located in the stomach, from which it was removed through a small incision, about an inch long. The stomach was closed with two rows of sutures, and the abdominal wall with four rows.

The animal was sent home the following day and seemed to be in good shape. It died two days later, however, and was autopsied. A badly infected wound was found, with gangrenous surfaces; little or no peritonitis was in evidence and the wound in the wall of the stomach was found to be covered with omentum, with perfect union. A large amount of fluid was found in the thoracic cavity—a fact not easily explained.

Inasmuch as the operation was aseptically carried out, it seems probable that contamination of the wound was brought about by the gastric contents.

Necrosis of Intestine Due to Sand Burs.—

Case No. 2.—The patient was a three-year-old mongrel, female.

History.—Severe vomiting spells had come on during the past ten days, with a complete loss of appetite. The vomitus contained only froth, for the most part, and the patient was gradually becoming weaker.

Symptoms.—Hemorrhage from the bowels was evidenced. Several ounces of dark, chocolate-colored fluid was involuntarily passed and the abdomen was so tender that a thorough palpation of the region was not made. Upon examination of the rectum it was found to be full of sand-burrs; she had pulled the burrs from her coat and swallowed them.

Autopsy Fingings.—Intense gastro-enteritis. The stomach was empty but sections of the intestinal tract were found to be packed

with grass and sand burrs. In one section about five inches in length the mucous membrane was in shreds.

Double Intussusception.—

Case No. 3.—A four-month-old female Pointer was brought to the hospital from a neighboring town.

History.—The patient had been sick for several days, according to the owner. She had been unable to retain any food and the feces were chocolate colored; the appetite was very poor.

Case No. 3, Intussusception

Symptoms.—The pulse and respiration were normal, and the temperature practically so. The animal was very thin and assumed a peculiar attitude, resting the sternum on the ground with the hind parts elevated (see illustration). Vomiting was frequent; abdomen was empty so far as palpation revealed; there was no discharge from the eyes or nose.

Treatment—Intestinal antiseptics were administered over a period of twelve days, bismuth subgallate being the chief one used. Cod liver oil was given daily, and nourishing food was fed, much of which was vomited at times. At the end of eight days she was sent home; the appetite was improved but she still maintained her characteristic pose—the sternum on the ground and hind parts elevated.

On the thirteenth day she was worse and was returned to the hospital and operated upon. A laparotomy revealed a double intussusception the first part of which was about eight inches in length, and the second part four inches long. The first part was pressed out, but the shorter one was edematous and was resected. Even then it could not be reduced. The ileum was sutured directly to the transverse colon. The patient died about twenty hours later.

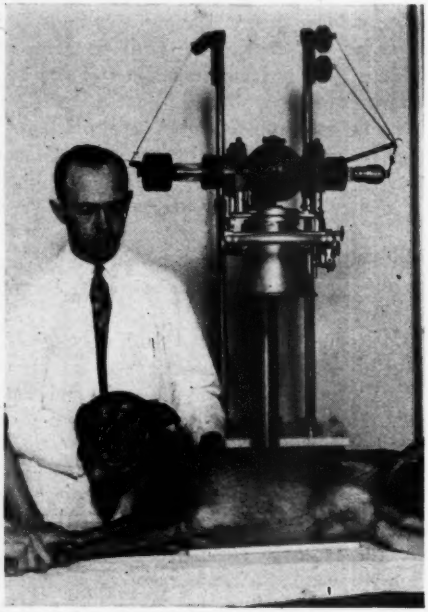
Case No. 4.—A twenty-month-old male Airedale was in the hospital for treatment.

History.—He had vomited occasionally for about two months, but far more often since swallowing a round bone about five or six days previously.

Symptoms.—Severe depression; abdominal pain; vomited two cupfuls of brown fluid following a high enema. The intestines apparently empty.

Fluoroscopic examination revealed an oval, solid body, slightly smaller than a golf ball, in the lower abdominal region, a few inches posterior to the last rib.

Treatment.—Laparotomy. A small rock was removed from the intestines. The patient died about sixty hours later.



Using the X-ray machine in a New York Hospital for animals

DUMB RABIES IN A DOG

The illustration shows two cases of dumb rabies which entered the hospital the first week in June.

Case 1, on the left, is a five-year-old English setter brought to the hospital on June 1, 1931 for a bath. The animal did not appear normal upon examination and the owner was advised against a bath, but asked to leave the dog for further observation for a few days. The next morning the patient showed a well developed case of dumb rabies. It died on June 4th.

Case 2, on the right, is a Scotch collie, six years old, which was brought to the hospital on May 31st, showing typical symptoms of dumb rabies. This case remained almost normal, except for paralysis of the lower jaw and muscles of deglutation. He recognized his name and responded to commands until June 6th when he gradually grew weaker and was destroyed.

Note the setter was almost too weak to stand when the picture was taken on June 3rd and died the next day, while the collie was very alert and strong and lived seven days after the disease was recognized and three days after the photo was taken. We have had cases of dumb rabies live two weeks; and others to die in two or three days.

S. W. Haigler.

St. Louis, Mo.

TETANUS IN A DOG

On the evening of April 24, 1931, we were called to see a dog that was acting peculiarly. It was after dark and the dog was kept in the back yard, so that it was hard to see very clearly all the symptoms. The owner was advised that the case was suspected of being rabies. He was further told to confine the animal, and that we would send the ambulance for it the next morning. Upon seeing the patient under favorable conditions a diagnosis of tetanus was made.

The eyes were drawn, all muscles were tense and rigid, and any sudden noise caused tetanic convulsions.

The patient was kept in a dark, quiet kennel, and the only treatment administered was as follows: 5cc of a 20% solution of magnesium sulphate subcutaneously every forty-eight hours for five doses. The bowels were kept in good condition. The patient began to eat after two or three days and made a good recovery in about two weeks. No tetanus antitoxin was given as the owner did not care to go to that expense on the animal.

The above illustration shows the rigidity of the muscles and the drawn condition of the eye. The patient was a fine specimen of Chesapeake retriever.

S. W. Haigler.

St. Louis, Mo.

Rabies Case No. 1 Telanus in a Chesapeake Retriever Rabies Case No. 2

Ultra-Violet Therapy in Small Animal Practice

By J. G. HORNING and A. J. McKEE, Houston, Texas

FROM time immemorial heliotherapy has been practiced in obedience to the natural biologic laws, and in man it has been furthered by observation of the results obtained. In 1889 Widmark of Stockholm, called attention to the inflammation produced on skin when exposed to his rock crystal lamp and stated that it was due to the ultra-violet ray and not the heat ray as had been thought up to that time. Neils Finsen of Copenhagen confirmed this in 1891 and in his experiments with the carbon arcs in the treatment of tuberculosis of the skin which he reported in 1893, he is credited with laying the foundation of the present scientific use of ultra-violet therapy. After this start with the artificial ultra-violet quite a bit of work was carried on by numerous investigators, the arcs were improved by the addition of chemical elements and different amounts of ultra-violet rays produced. While scientific data on ultra-violet therapy was accumulating, the outstanding addition to the work of Widmark and Finsen was the development of the mercury vapor arc in quartz by Peter Cooper Hewitt in 1901. Much supposed progress was made in this therapy in the years to follow but the lamps were cumbersome and needed much improvement for practical use, also a great amount of alleged data had been proved of no value, not being based upon facts. Many extravagant claims were made and while much good was accomplished a great deal of harm was done by the empirical exploitation of these lamps by all classes following the great publicity given to this therapy as favorable facts were proved and set forth in the scientific journals.

The next great addition to this therapy was when Hess in New York and Steenbock and Black at the University of Wisconsin proved the correlation of vitamin D and ultra-violet light, this was in 1924. Other proved developments will be incorporated further in the article. Anyone contemplating the use of ultra-violet therapy should first have a fair idea of what the ultra-violet ray really is. Without delving too far into the physics of light we will try and demonstrate a word picture of this.

The light spectrum is divided up into waves each color having its own wave length. The special unit of measurement for these wave lengths is the Angstrom Unit (named after the Swedish physicist, Anders Jonas Angstrom). This unit is one ten-millionth of a millimeter in length or one two-hundred-fifty-four millionths of an inch. Thus the term "ray" and "wave" have the same meaning in this article, being termed a unit of radiation in which the question of breadth is not considered.

The light spectrum used in medicine is as follows:

Ultra-Gamma rays	0.01	A. U.
Gamma rays	1.4	A. U.
X-rays	136.	A. U.
Ultra-violet rays	3900.	A. U.
Violet rays	4100.	A. U.
Indigo rays	4400.	A. U.
Blue rays	4750.	A. U.
Green rays	5200.	A. U.
Yellow rays	5510.	A. U.
Orange rays	6000.	A. U.
Red rays	6500.	A. U.
Infra-red rays	64000.	A. U.

The visible rays are from 4000 A. U. to 8000 A. U. This gives an idea of the spectrum and the relation the ultra-violet rays hold to it. As all know the violet to red rays in the foregoing list are the

seven colors of the rainbow and combined constitute white or clear light.

When one looks at the light from an ultra-violet lamp the rays seen are not the ultra-violet rays, but the visible rays of the spectrum, the ultra-violet ray is invisible; however the field of visible light is accompanied by the ultra-violet rays, according to the amount created by the lamp used.

There are two kinds of ultra-violet lamps in common use; the mercury vapor arc in quartz and the carbon arc with and without a metal wick. We prefer the mercury vapor arc in quartz type and in our practice use the Alpine Sun Lamp, Luxor model. We have used this type of lamp since 1927 with splendid results and no trouble whatsoever. This type of lamp gives off waves as short as 1850 A. U. It has been demonstrated that this type of lamp has a higher intensity in the shorter radiations than the carbon arc.

Many writers on this subject claim that the hair of animals and its high degree of pigmentation make the resistance to ultra-violet rays very high, this is stated as being true also with the feathers on birds. The exact part and method of the ultra-violet ray entrance into the skin is still open to question. However, we do know that the action of the ultra-violet rays on the living tissues produces vitamin D from the ergosterol of the skin. Hess and Anderson also proved that the most potent ultra-violet rays for the curative treatment of rickets were the very short ones ranging from 2500 A. U. to 2800 A. U., the ones that are artificially produced. Exposure to ultra-violet light produces a marked effect on calcium and phosphorous metabolism—one reason that pups and kittens radiated with it have better developed bones and teeth than those not so radiated.

The conditions of modern civilization create a great field for ultra-violet ray therapy in small animal practice; and the larger the city the greater the opportunity for its use. While the atmospheric ultra-violet intensity varies according to the season, latitude and the amount of smoke, dust or other obstruction in the atmosphere, the number of household pets that are kept within doors with little chance for exposure to sun light, gives the veterinarian an opportunity to render a

Fig. 1. Monthly radiation of a Chow that had no opportunity for outdoor exercise

worthwhile service in the regular treatment of these pets with the mercury quartz lamp, and proper advice as to diet.

Radiating dogs and cats for stimulative treatment can best be done in the cage as shown in Fig. 1. The length of the radiation depends upon the age, color and condition of the patient. We usually start them at fifteen minutes and increase it five minutes each treatment until thirty

minutes is reached giving the treatment three days apart. Dogs that are bathed respond better to the treatment than those not recently bathed. Some cases are held on the table and radiated at an 18-inch distance the attendant brushing the hair back and forth with his hand, this treatment is started at ten minutes for long haired and five minutes for short haired dogs and increased five minutes every third day until a twenty minute

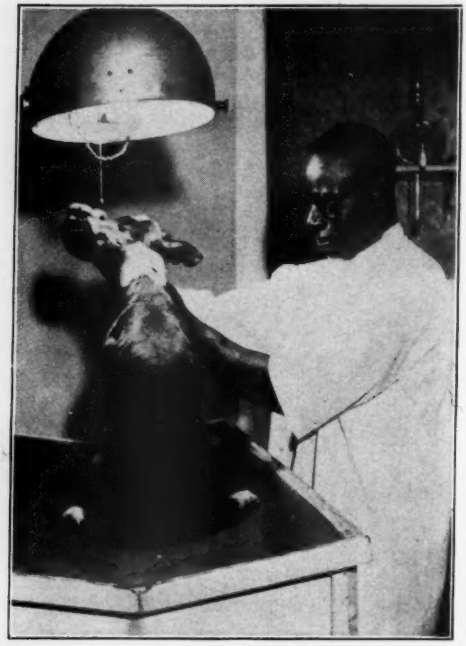


Fig. 2. Ultra-violet therapy used on a badly lacerated ear that showed little tendency to heal

period is given. In all cases the eyes are protected by a plain petrolatum or mercury oxide ointment placed on the eye ball.

There is no way we can be sure of the owners returning their dogs at stated intervals for treatment, however, it has been our experience that a few treatments so convinces the owner of its beneficial effect that he will send the closely confined animal in for a bath and treatment when its coat shows a dead look and the animal is acting rather "pepless."

Slow healing wounds, indolent ulcers, etc. can be stimulated with a 12-inch, five minute exposure See Fig. 2. Splendid results have been obtained in treating cases of moist eczema, by clipping the hair away from the area infected, washing the part with warm water and a mild soap, rinsing with warm water, drying thoroughly, touching with alcohol and then giving a 12-inch, three-minute exposure. Wash the parts once or twice a day after this treatment and apply borated talcum to the part. A long standing case should be given daily radiations for the first three days of hospitalization, however, very few need this much. Various types of chronic skin infections respond to the bath and ultra-violet radiation. Some veterinarians report having cured many cases of demodectic mange with the ultra-violet ray, and quite a few use it as an adjunct in their treatment of this condition. Of the two cases of demodectic mange treated by us, one failed to respond, and one was cured.

In blepharitis, purulent conjunctivitis and corneal ulcers daily radiation of five minutes at 24 inches has proved beneficial.

In treating the mixed infections following distemper, 20-minute exposures at 24 inches have been satisfactory in our hands when given every other day. As an after treatment for any debilitating condition one or two treatments a week of a 20-minute, 24-inch exposure, combined with the proper after care hastens recovery.

As mentioned earlier, ultra-violet radiation is absolutely curative for rickets in pups and kittens. In many cases 15-minute, 24-inch exposure is sufficient when given three times a week, or daily radiation when indicated is not amiss in rickets.

In the treatment of apes, monkeys, marmosets and lemurs, for osteomalacia, cage paralysis (rickets), and when used

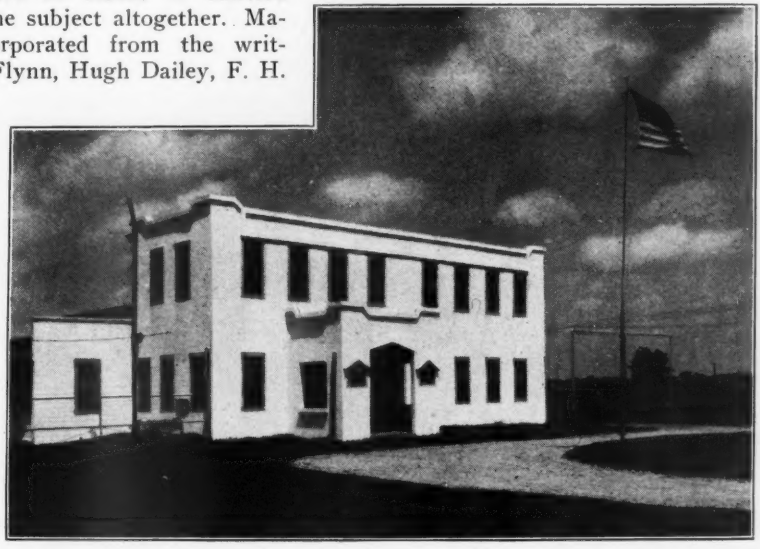
as a routine measure for sustaining their general health, under their abnormal living conditions, ultra-violet light therapy has been a great help to veterinarians in attendance at zoos.

The principles for the use of ultra-violet light with poultry apply also to cage birds. Birds receiving radiation are healthier and more productive. It improves the hatchability of the eggs and increases the amount of lime in the shell and produces sturdier chicks. It raises the vitality of the birds during the late fall, winter and early spring. By radiating baby chicks it acts as a preventive against leg weakness, and increases their growth and development.

We hope that this article has presented the subject clearly enough to create further interest in this field. In compiling the article from our own notes and observations as well as from articles by others, we have avoided repetition of claims advanced by various investigators, and endeavored to present only those ideas that have been accepted as facts. Where there is any doubt about certain things we have so stated or omitted that part of the subject altogether. Material is incorporated from the writings of J. C. Flynn, Hugh Dailey, F. H. Stainton, Marotel, Pierron, Stroumza, W. J. Lentz, F. Liegeois, Perry, Lucas, C. V. Noback, E. B. Dibbell, Miss Hume, Hardenburgh, Shread, Steenbock, Black, Hess, Anderson and the scientific department of the Hanovia Chemical and Manufacturing Company.

LOCAL ANESTHESIA IN FRACTURES

According to Hosford, local anesthesia for setting fractures, when performed by injecting *2%* procaine hydrochloride directly into the hematoma which surrounds all parts of the fracture, is a safe and practicable procedure. Beyond the prick of the first hypodermic needle there should be no pain, except occasionally as the needle penetrates the periosteum, and sometimes as the bruised soft tissues are pressed on during reduction. The latter, however, occurs only in fractures due to direct violence. Muscular relaxation should be as good as it is with general ether anesthesia and better than is usually obtained with nitrous oxide-oxygen. Roentgenograms should always be taken before injecting the procaine hydrochloride so as to be as certain as possible of getting the solution between, or against, the fragments, as failure to do this is almost invariably the cause of failure to bring about relief of pain and relaxation of muscle spasm, provided a freshly prepared *2%* solution is used.—*Jour. A. M. A.; 97*:2:139.



VETERINARY SERVICE INSTITUTE AND ALAMO DOG AND CAT HOSPITAL
Offices, hospital and laboratories, U. E. Marney, K.C.V.C., '12; V. H. Fondreu, O.S.U., '28, and E. A. Maier, Texas A. & M., '32, Proprietors, San Antonio, Texas

Digest of Reports on Avertin Narcosis in Dogs and Cats

By FRITZ VOLKMAR, Columbus, Ohio

LIKE most other phases of Veterinary Science at the present time, therapeutical procedures and especially the methods of anesthesia and narcosis are in a state of flux. Old standbys among the narcotics are thrown into the discard and in their stead new remedies for the relief of pain are put to the crux of the test, out of which the perfect anesthetic will ultimately arise. The general practitioner, however, is bewildered by a motly of new drugs with fancy but unintelligible names which do not give a clue to the possible merits they may possess.

Avertin (formerly E-107) is chemically tribromethanol. It is a white, crystalline substance, easily sublimated, having a melting point of 79° to 80° C. It is water soluble at 40° C. to 3.5%. In water vapor it is volatile. Air and light will disintegrate it. When dissolving it in water, moderate temperatures should be used to guard against loss. It will not disintegrate in water at 35° to 40° C., but at temperatures of 70° C. and higher, hydrobromic acid separates and dibromic acetaldehyde results, according to the formula: $CBr_3CH_2OH - HBr \longrightarrow CBr_2CHOH \longrightarrow CHBr_2CHO$. The formation of dibromic acetaldehyde, minute particles of which will cause severe caustic lesions, must be avoided by all means. Following is the direction for solution: The amount of distilled water required for a 3% solution is heated in a waterbath to 35° to 45° C. (95° to 104° F.) and the calculated amount of the substance (solid or liquid) is added. Vigorous shaking of the flask will result in a clear solution within five minutes. It should not be kept longer than 12 hours before use. When tested with Congo-red solution, the Avertin solution should not turn blue. It is used either orally, rectally or intravenously. In either way, Avertin produces loss of pain sensation, of reflexes, of consciousness; thus true narcosis is obtained. The duration of narcosis depends to a great extent upon the method of administration. Intravenous injection causes narcosis almost immediately, but is of brief duration. Administered rectally or per os, narcosis sets in after about 5 to 10 minutes and lasts over one hour, in cats up to 24 hours. The beginning of narcosis depends on the concentration of the drug in the blood and will vary with the difference in time of resorption.

The therapeutic margin, that is the safety margin between the lethal dose and the dose producing full narcosis, varies with the method of application. For rabbits the quotient of lethal and narcotic dose has been calculated at 1.75 in the rectal application. Freese 1928 and Völker 1931 found the quotient for oral and rectal application to be 1. The latter determined the therapeutic margin for the intravenous application in dogs to lie between 2 and 2.5.

In case of poisoning, collapse occurs early, according to Wright 1931, usually from 5 to 10 minutes after injection. In cats there is a noticeable change in respiration; a deep inspiratory movement is followed by a quivering of the abdominal muscles after which all respiratory movement may cease. Sometimes the Cheyne-Stokes type of breathing is observed. The heart always continues to beat from 2 to 10 minutes after respiratory movements cease. Prompt antidotal treatment should be given (strychnine 0.002gm; lobeline). Völker 1931 had excellent results with carbonic acid which he always keeps ready in case of emergency.

Detoxication of the drug, except in cats, is very rapid. It results from its affinity for glycuronic acid. In this combination it is eliminated by the kidneys. Over 50% of the amount of Avertin administered may be demonstrated in the urine after narcosis. It is said that the protective rôle of the liver

is proportional to its glycogen content, so that with fasting animals the dose must be reduced. Cachectic animals are said to be more sensitive to the drug than normal animals. In common with other soporifics, Avertin has a slight antipyretic action.

Advantages of the Avertin narcosis are, that fasting is not necessary, but since it has been shown that fasting animals require less of the drug, a considerable saving may be made by having the animals purged and fasted. Another factor is that the psychic trauma of the exciting moment of the beginning narcosis is avoided. Awakening is rapid, without any ill effects such as nausea, ptyalism, excitement or other physical handicaps. Avertin is especially serviceable for operations about the head. It does not have an irritant effect upon the rectal mucosa and does not produce straining. It is rapidly absorbed and rapidly eliminated. However, caution is voiced not to force the narcosis because the tolerance differs in individual animals. Avertin therefore should be employed mostly as a basal narcotic and the crest of narcosis would have to be attained, as a rule, by supplementary narcotics (inhalation anesthetics). In this its use resembles common employment of morphine preliminary to ether or chloroform anesthesia. Very little of the inhalation is required to complete a profound anesthesia after the use of Avertin, it is said. Sometimes not more than two inhalations.

Eichholtz 1927 was the first one to employ Avertin experimentally in animals. His table of dosage in cc per Kgm liveweight in different animals is here reproduced:

Application	Rabbit	Cat	Dog
Rectal	0.15 light sleep 0.2 deep sleep 0.3–0.5 narcosis	0.3–0.5 narcosis	0.5 narcosis
Per os	0.2–0.3 sleep 0.4–0.5 deep sleep 0.6–1.6 narcosis 2.0 lethal dose	0.1 narcosis 0.15 lethal dose	0.2–0.4 narcosis (Spicer 1931) 0.4 lethal dose (Spicer 1931)
Subcutaneous	0.15 light sleep 0.5 narcosis	.....	.....
Intravenous	0.05 sleep 0.08 narcosis 0.12–0.15 lethal dose	0.1 narcosis	0.12 narcosis

Stiasny 1927 used Avertin dissolved in olive oil, per rectum. He obtained serviceable narcosis with 0.8gm per Kgm bodyweight. In some cases additional doses of 0.2gm per Kgm were necessary. This author observed that during the narcosis the calcium level of the serum fell 7% to 13%. In this connection it may be mentioned that a reduction in the calcium and sodium content of the blood is said to increase the toxicity of Avertin and therefore reduces the quantity necessary to produce narcosis.

Stotz 1928 concludes from his experiments that the therapeutical margin is too small for practical purposes, that a serviceable optimal dose cannot be recommended safely and that, therefore, it is not adapted as a narcotic for dogs and cats but that it may be of possible use as a basal narcotic. He disapproves of the peritoneal use of it.

Freese 1928 states that, according to his experience, Avertin is not adapted, either for rectal or intraperitoneal application. Oral application seemed to give better results, but they were not satisfactory due to the difficulty of the application and the inconsistency of the results.

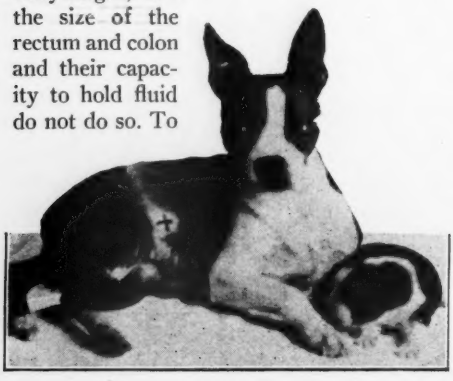
Jordanoff 1931 points out that the failures and disappointments in the use of Avertin may be due to the mistake of trying to force a full narcosis with it, instead of using it merely as a basal narcotic.

Kirk 1930 gives case reports of two dogs and four cats narcotized per rectum. The dosage corresponded to about 0.2cc in dogs and 0.25cc in cats per Kgm. Complete anesthesia set in after 3 to 7½ minutes. Two cases ended fatally, one, a dog, extremely

emaciated, and one, a cat, in which the sleep lasted 36 hours.

Wright 1931 used Avertin in 37 dogs and 70 cats. In cats he found the rectal dose to be 0.3cc per Kgm. The dose was computed by bodyweight, but disease, age and other factors were taken into consideration. Young animals seem to tolerate greater amounts than adults. General anesthesia resulted in 60% of the patients. In the remaining 40% the incomplete anesthesia had to be completed by inhalation narcosis. The author had two deaths in cats attributable to Avertin. In dogs the dose to produce narcosis was found to vary between 0.4cc and 0.6cc per Kgm. The narcosis produced was in no way constant, varying from a transient stupor to a profound general anesthesia. The duration of the effect was always short as compared with that of the cat and often unstable. The therapeutic margin, too, was smaller. A dose capable of producing serviceable narcosis may cause respiratory failure. Three deaths occurred among these dogs, attributable to Avertin.

Spicer 1931 mentions as objectionable features of the rectal application of Avertin the leakage of the fluid from the rectum as soon as the animal becomes unconscious and especially when the tube is removed. This leakage soils the posterior parts of the animal and the operating table and makes accurate dosage impossible. He points out that the recommended dose of Avertin is based on the weight of the patient and thus the amount of water required to dissolve Avertin is increased in exact ratio with the bodyweight, but the size of the rectum and colon and their capacity to hold fluid do not do so. To overcome this handicap, two methods are proposed. One is the use of a rubber catheter surrounded by a rubber bulb, devised by the author. Inflation of the bulb after the onset of the narcosis will block the passage and prevent leakage. The other method is the giving of Avertin per os for which purpose the author also devised a special mouthgag, since drenching is not advisable due to the bulk, the disagreeable taste and consequent ptyalism; hence a stomach tube must be used. The amount of Avertin to produce narcosis in dogs was 0.2cc to 0.3cc per os per Kgm. The onset of narcosis occurred between three and twelve minutes after administration and the duration was between one-half and two hours. The dosage per rectum in dogs was 0.3cc to 0.4cc. The onset of narcosis lay between 5 and 10 minutes. The duration was from 45 minutes to two hours.



Völker 1931 uses Avertin intravenously. His dosage is 0.12gm per Kgm. For a dog weighing 10 Kgm this amounts to 50cc of a 2.5% solution. If narcosis has not set in immediately after the injection, an additional 25% of the original dose is given. This overdose, if necessary, may be increased up to 50% above the calculated dose, except in old animals. Due to the immense power of reduction and detoxication possessed by the dog's liver, the injection has to be made rather fast, that is, within one to one and a half minutes. A table in the original article facilitates the computing of the required amount for dogs weighing from 10 to 60 pounds. In over 200 cases of intravenous injection the author had only one fatality, and that in an old dog.

His method of narcosis is applicable to minor operations not exceeding 7 to 10 minutes duration. For major operations such as hysterectomy laporotomy, etc., the Avertin narcosis has to be carried over into an ether narcosis.

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INTESTINAL TOXEMIA OF THE DOG

This is one of the most common ailments we are called upon to treat. The cause is usually improper feeding, insufficient exercise and resultant constipation. The smaller breeds, Bostons, Pekingese, Poodles, Pomeranians and Dachshunds are more susceptible than the large breeds.

The symptoms usually develop slowly. The dog becomes listless, gradually loses his appetite, and occasionally vomits his food. He drinks large quantities of water but soon vomits it. The abdomen is tense and pressure or manipulation causes pain. The gait is stiff and deliberate. The breath is foul. Constipation is the rule but occasionally there is diarrhea.

The treatment consists in the elimination of the poisons which have accumulated in and are being absorbed from the intestinal canal. This is accomplished by a thorough irrigation of the intestine with hot water and bicarbonate of soda, two ounces to a gallon of water, followed by calomel in small divided doses and the following morning, a dose of milk of magnesia. All solid food is withheld for twenty-four hours, then a diet of milk is supplied. Acidophilous milk, buttermilk, mutton broth, zwieback, raw eggs, and vegetable soups such as celery, tomato, and asparagus. All constipating foods should be avoided. The bowels should be kept regular with daily enemas if necessary to prevent intestinal fermentation and accumulation of gas.

The medicinal treatment consists of small doses of iron, quinine and strychnine, syrup of hypophosphites, bismuth, pepsin, pancreatin, dilute hydrochloric acid, hydrastin, etc., whichever best agrees with the patient. Usually a week or ten days energetic treatment will work wonders with most of these cases.

The condition is very liable to recur and become more or less chronic eventually leading to cirrhosis of the liver and hydroperitonitis. These cases are, of course, incurable. In the majority of cases they originated as toxemias from incorrect feeding.

Occasionally weakness of the hind legs and paralysis appear. This is especially likely in the long bodied dogs. The spine above the tail is usually very sensitive and the dog will evidence pain when this spot is manipulated. While such cases look hopeless, it is better not to get discouraged as I have seen many, seemingly hopeless cases, make a complete recovery. A high irrigation daily with a diet such as I have mentioned, exposure to the Alpine sun lamp daily, encouraging the dog to walk by lifting on his tail to steady him, a gentle massaging of the spine with iodex cum methyl salicylate twice a day, nerve tonics, hypophosphites, cod liver oil, etc., are beneficial.

While the foregoing treatment may sound simple I have seen a good many dogs regain complete control of the hind legs after a treatment lasting several weeks. Occasionally we find cases that do not respond to any treatment and that have to be destroyed.

J. Elliott Crawford.

Far Rockaway, N. Y.

HOW TO GIVE A DOG CASTOR OIL

It should be of interest, especially to some of the younger practitioners, to know how to give a dog a dose of castor oil. I had graduated and been in the field many years before I learned how to give it effectually with ease.

Grasp the dog by the muzzle with the left hand, elevate his nose and with the bottle of castor oil in the right hand, simply pour from the bottle letting the oil strike the dog's nose by way of that little groove. As the oil touches this sensitive part of the dog, he immediately starts to lick it in without objection, and the entire contents of the bottle may be poured down, if one wishes, with the greatest ease. We know that a dog objects to having his mouth forced open and medicines poured down his throat, but he does not object to taking oil by the method described.

Mark White.

Chicago, Illinois.

Pernocton Narcosis for Dogs*

By DOCTOR JACOBI, Luebeck, Germany

GENERAL anesthesia in small animals has ever been the child of many sorrows for the practitioner. Personally the author is ready to state that, so far, every anesthetic has fallen short of his expectation. And yet, anesthesia is one of the most important aids to the small animal practitioner, and one with which he cannot dispense. Calm and deliberate work is practically impossible without it. Many an operation which could be performed without narcosis is frustrated by the unreasonableness of the animal patient. For example, is it possible to extract a tooth in a full grown German Shepherd dog without previous narcosis? Emphatically not, except in a clinic with sufficiently trained personnel at hand. The same applies to appropriate splinting and dressing of bone fractures. Numerous other examples might be cited.

The principal anesthetic in canine practice is morphine, injected subcutaneously. In spite of its good points, there are also many objections against it. Objectionable is the annoying vomiting, occurring, usually, shortly after the injection. To this must be added that animal patients whine and moan for hours, leaving a rather unfavorable impression upon the owner. Finally the weakness of the hindquarters should be mentioned, occurring as a sequel to morphine narcosis and noticeable as late as 24 hours after injection.

Chloroform and ether, used for inhalation anesthesia are likewise not very popular because they are not without danger and often the stage of relaxation is preceded by a pronounced stage of excitement. Nevertheless, in some cases the author was able to reenforce effectively the morphine narcosis by inhalation anesthesia (chloroform and ether, equal parts). Chloral hydrate and other narcotics are little used in small animal practice, therefore, there is no need to discuss them here.

In the following, attention is called to a narcotic which the author has been using for three years in his clinic and which he has found exceedingly satisfactory. Although it is not entirely free from disadvantages, he prefers it by far to morphine. The narcotic in question is Pernocton. It is a 10% aqueous solution of a derivative of barbituric acid. The following are its essential qualities: Injected intravenously, narcosis takes effect quickly, as a rule, during the act of injection. Its action is decidedly hypnotic; its toxicity is very low. Disagreeable after effects are entirely absent. The optimal limits of action have been determined for the intravenous as well as for the subcutaneous injection by tests on rabbits. Briefly reviewed, the following values have been found:

(*a*) for intravenous injection:

0.007gm per Kgm liveweight, lowest limit for action.

0.025gm per Kgm liveweight, sound sleep, exceeding 1½ hrs. duration.

0.040gm per Kgm liveweight, narcosis of several hours duration.

0.070gm per Kgm liveweight, profound narcosis of respiratory centers, endangering life.

The therapeutic latitude for intravenous injection therefore equals 10.

(*b*) for subcutaneous injection:

0.008gm per Kgm liveweight, lowest limit of action.

0.160gm per Kgm liveweight, minimal lethal dose.

The therapeutic latitude for subcutaneous injection therefore equals 20.

To Prof. Dr. Hinz (1929) belongs the merit for having introduced Pernocton into veterinary therapeutics. His experiences were very favorable. Freese (1928) mentions unfavorable results. Additional favorable results with Pernocton in dogs and cats are reported by Prof. Berg (1929), Westhues (1929) and Jordanoff (1931).

Since the intravenous injection in dogs is

* Authorized translation from *"Tierärztliche Rundschau"* 37:331-332 (May 10, 1931) by Fritz Volkmar, Columbus, Ohio.

a rather fussy procedure and difficult to obtain, the author now employs, almost exclusively, the subcutaneous injection. The narcosis is exactly of the same duration and depth as with the intravenous method except that, as one would expect, the onset of narcosis is delayed. With the subcutaneous method, experience has been shown that after 1½ to 2 hours the narcosis is sufficiently deep for the operation to be started. In every instance the narcosis obtained was of sufficient length for the completion of the operation. During intravenous injection, attention has to be paid that under no circumstances the injection be made too fast, otherwise unpleasant secondary manifestations will result, such as excitement, shock, etc. The duration of intravenous injection should occupy at least two minutes in order to guard against untoward sequelae.

During the Pernocton-narcosis the dog sleeps peacefully and soundly. The author has checked carefully the heart activity in many cases and found that it remained entirely uninfluenced, either before, during or after narcosis. Respiration is mostly deep and ample. In isolated cases, superficial respiration and intermittant respiration (Cheyne-Stokes respiration) has been observed without the detection of any subsequent harm from it. Awakening is mostly characterized by a prodromal symptom of slight uneasiness. Immediately afterwards the animals are again entirely lively and sprightly; they partake of water and food and act as if nothing has happened. The average duration of narcosis is from 8 to 12 hours.

Ever since 1928 the author has employed in his clinic both the intravenous and the subcutaneous method. In either case the amount of Pernocton injected was 0.03gm per Kgm liveweight. One cc of the injection fluid contains 0.1gm substance. Thus the amount necessary for a specific case may easily be computed. For instance, a German Shepherd dog weighing 30 Kgm will require for narcosis 30×0.03gm, that is 0.9gm substance. Since 1cc contains 0.1gm Pernocton, consequently the amount to be injected corresponds to 9cc of the solution. By the aid of this calculation, the author was able always to get complete narcosis of sufficient depth. In the following a small selection of cases is offered, that the reader may form an opinion as to the extent and gravity of the operations in which Pernocton gave complete satisfaction as a narcotic.

Case 1. French bull terrier, female, 12 Kgm, had given birth to two whelps. Another whelp presented itself in the passage, but, owing to its large size, caused dystocia. The author was consulted by the owner and advised Cæsarian section. The owner consented; the dog was given 4cc Pernocton solution subcutaneously. Deep narcosis resulted in 1¼ hours, so that the operation could be performed. One dead and one living puppy were extracted. The bitch awoke after 12 hours sleep and made an uneventful recovery.

Case 2. German Shepherd, eight months old, weighing 22 Kgm. Pressure fibroma on the lateral hock joint, size of pigeon egg. The dog was given 6.5cc Pernocton solution subcutaneously. An hour later he was soundly asleep and ready for the operation. Awakening eight hours later.

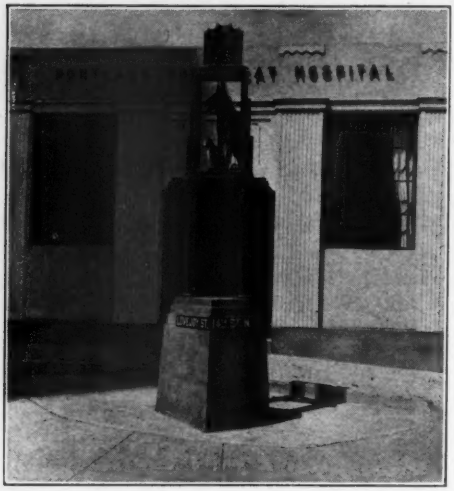
Case 3. German Shepherd dog, weight 30 Kgm. Carcinomatous tumor on the penis. A subcutaneous injection of 9cc Pernocton was given. Deep narcosis followed in 1½ hours. The operation proceeded without further aid. The dog awakened after 10 hours and was lively and spry.

Case 4. St. Bernard, male, weight 51 Kgm. Fracture of the left upper canine tooth. Wound of the jaw. The dog was given 15cc Pernocton and was asleep two hours later. The operation was performed. The patient awakened after about 10 hours.

Case 5. Black and tan terrier, weight one Kgm. Fracture of the left forearm. The terrier was very alert and lively. It was a foregone conclusion that the fracture could not be reduced properly without narcosis. The animal received 1/3cc Pernocton subcutaneously. Sleep occurred after about one hour and lasted for 10 hours. During this time splint dressing was properly applied and saturated with sodium silicate.

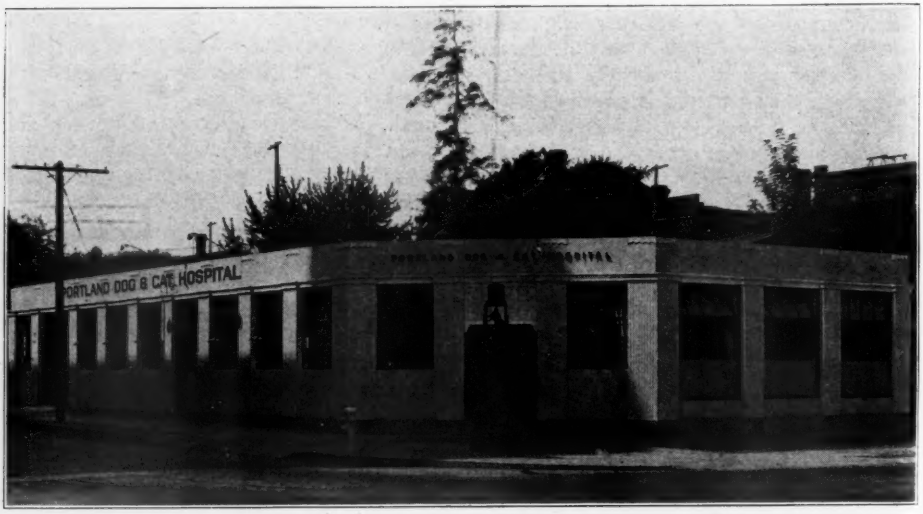
Case 6. Wirehaired terrier, weight eight Kgm. Accidentally shot during a hunt. The terrier received 2.5cc Pernocton subcu-

taneously. Deep sleep followed in one hour. The animal rested perfectly quiet without any restraint. The operation was commenced. During the operation it is found that complication existed with severe intestinal and kidney lesions. The prognosis was changed to unfavorable and the patient painlessly destroyed with permission of the owner.



This dog and cat statue marking the corner of Lovejoy and 14th Streets in Portland, Oreg., was designed by a veterinarian and erected in front of a veterinary hospital

Summarizing it may be stated: Pernocton is an excellent narcotic for small animal practice. The anesthesia is of sufficient depth, so that it is unnecessary to employ supplementary narcotics. The duration of anesthesia is from 8 to 12 hours. It is far superior to morphine, because vomiting does not occur, moaning and whining are likewise absent as is also the feebleness of the hindquarters. The unpleasant effects of Pernocton sleep pass away much quicker, and after awakening from the sleep the animal seems to be well and hearty. The narcosis by the subcutaneous method sets in at about the same period after infection as does morphine narcosis. If a prompt and profound narcosis is required, then the Pernocton should be given intravenously. This much is certain, the author prefers Pernocton far above morphine and would not care to be without it. One slight disadvantage should not be concealed: In most cases Pernocton narcosis is more expensive than morphine narcosis, but if it possesses immense advantages, will its cost play a rôle in surgical dog practice?



The Portland Dog & Cat Hospital is located on a busy street intersection. There is a private driveway between the statue shown in the center and the front door

Portland (Oregon) Dog and Cat Hospital

The new hospital of Fred C. Schmidt, Toronto University '21, and Wm. E. Ruggles, Colorado Agricultural College, '27, was completed a little more than a year ago. A formal opening was held September 16, 1930.

The practice of this firm has shown a phenomenal growth since its establishment in 1921. They now own one of the largest, most up-to-date and completely equipped hospitals in the northwest.

The hospital is located on one of the busiest thoroughfares of the city, an extremely desirable advertising feature.

The drive-up scheme (1) is an innovation in Portland, but it is an absolute necessity where parking space is nearly always at a premium. The dog and cat statue is unique and imposing. It was designed by Dr. Horst Schreck, El Paso, Texas.

The reception room (2) has red tiled floor and walls of California stucco of a light tan shade. It is light and airy. Its furnishings create an impression of cleanliness throughout the interior.

In the examination room (3) there is space for the necessary drugs and medicines for immediate treatment of patients entering the hospital. There is also an instrument case, a laboratory bench and a zinc-top table of special construction for the examination of patients. There is also an interesting display of surgical and pathological specimens which have been collected over a period of years.

The kitchen (4) is the envy of housekeepers. It is roomy and adequately equipped. The color scheme is modernistic.

The cat ward (5), is finished in a light green, giving the room the color effect believed to be quieting for hospitalized cats. The window has a screen that permits of opening without the danger of cats escaping.

The general ward kennels (6) vary in size and have removable galvanized iron pans in which sawdust and straw is placed for bedding. Hanging baskets of artificial flowers are among the decorations in all wards.

The surgery (7) is finished in white and has a 6x8 foot skylight facilitating daytime operations. For operations at night, there is a 300-watt light.

A feature of the hospital is the drying room (8). It consists of two steam coils placed horizontally eight inches above the floor. One foot above the coils on each side are six removable 3x3 foot slatted hardwood gratings on a double deck arrangement and separated by heavy wire partitions. The animals after bathing, are chained on these perches with the heat beneath them. A fan and ventilator gives sufficient circulation of air to dry a long haired dog in a very short time.

Cats and puppies are placed in all wire cages on the upper shelves. The clients like this arrangement and the branch of service has become very remunerative.

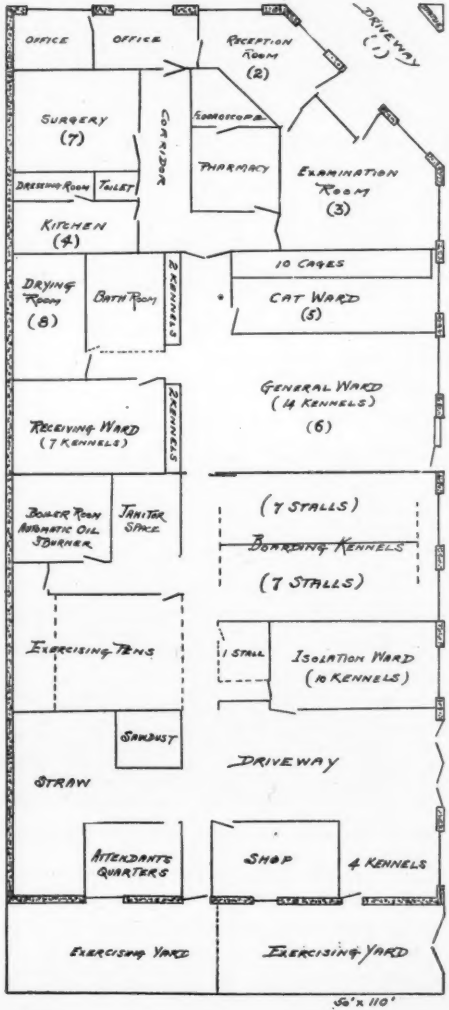
The building is well planned as to light, floor drainage and every means for the most efficient sanitation.

There are five large sky-lights and ventilators, twelve large outside windows and two transoms which give ample light and make possible satisfactory ventilation.

Scrubbing of the floors is simplified by floor grades and eleven drains. The automatic oil burner keeps the building at the desired temperature day and night.

The cat ward, general ward and all main partitions are of sound proof construction.

The accompanying sketch of the floor plan gives the location, size (50x110 feet) and arrangement of the hospital. The sketch is drawn to scale; ⅛ inch equals 1 foot.



Dental Anesthesia in the Dog

By E. R. FRANK, Manhattan, Kansas,
Division of Veterinary Medicine, Kansas State College

NERVE blocking of the infraorbital and mandibular alveolar nerves should be a common procedure for painful operations on the teeth of dogs. The dental canals are readily accessible so it is not a difficult process.

A 2% solution of procaine is preferred because it is reliable in action and comparatively non-toxic.

The instruments needed are a glass syringe and a 20-gauge needle, two inches long.

Fig. 1. Needle in proper position for blocking the infra-orbital nerve

The infraorbital nerve is a branch of the maxillary nerve and contributes dental branches to the upper teeth and after emerging from the infraorbital foramen supplies the upper lip and nose with filaments. The teeth and structures in the lower jaw are supplied by branches from the mandibular alveolar nerve.

The skin at the point of insertion of the needle should be disinfected and an insensitive wheal produced.

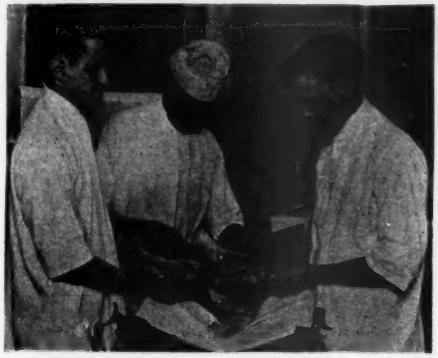
Fig. 2. Needle in proper position for blocking the mandibular alveolar nerve

The infraorbital nerve may be blocked at two points. One method is to select a point about one and one-half inches below the lateral canthus of the eye, in the space between the posterior border of the malar

bone and the anterior border of the coronoid process of the mandible. The needle is inserted vertically through the skin and pushed through the soft tissues in the space between the anterior border of the coronoid process of the mandible and the malar bone until its point has passed the edge of the latter. It is then directed forward along an imaginary line that would reach the gingival margin of the upper incisor teeth until the point of the needle reaches the maxillary foramen where the nerve is lodged and the injection is to be made. This is at a depth of approximately 1 to 1½ inches from the surface in a dog of average size.

Another method that of Jean-Fernand is to locate the infraorbital foramen, which is easily accomplished in the dog, and to insert the needle along the floor of the infraorbital canal for a short distance. At either point inject 2cc of a 2% solution of procaine. Anesthesia will be complete in ten minutes and last for approximately twenty minutes.

The mandibular alveolar nerve may be reached very easily to be injected. Pass the finger along the lower border of the mandible from front to back to a distinct depression. The point at which to insert the needle is at the lowest part of the depression. Insert the needle directly upward, close to the medial surface of the mandible for a distance of one-half to three-quarters of an inch and inject 2cc of a 2% procaine solution. Anesthesia will take place as described in the foregoing.



ANAEROBIC INFECTION FATAL TO A DOG

Subject.—A 50-pound, male stag hound.

History.—The owner stated that the hound had been slightly injured several days previously by a car. The injury consisted of a slight skin wound and a little lameness in the left hind leg. About four days later the animal had become quite lame and refused food. During this time the skin lesion had practically healed.

Symptoms.—Upon examination the hound was found to be in great distress. Movement was slow and painful, the affected limb being only partially extended during movement. Further examination revealed the left hind leg greatly swollen, hot, and painful, the swelling extending from the hip joint to the foot. The temperature was 105° F., the respirations and pulse accelerated, and the mucous membranes congested.

Diagnosis.—Probably septicemia as a result of wound infection.

Treatment.—An anodyne was administered to relieve the pain and hot fomentation packs of a saturated epsom salt solution were applied for about thirty minutes. Because of the condition of the hound no further treatment was given and within thirty minutes more the animal was dead.

Autopsy Findings. — The autopsy revealed all body lymph glands to be swollen and sero-hemorrhagic, and the subcutis and muscle of the affected limb infiltrated with a bloody edema; the muscle was blackened and glistening, very much resembling blackleg. A severe gastritis and enteritis was revealed; the intestines presenting submucous and subserous hemorrhages in some areas. The kidneys were acutely inflamed and there was blood tinged urine in the bladder. The lungs, liver, and spleen were excessively congested. Numerous small epicardial and endocardial hemorrhages occurred on the heart. Bacterial examination of the blackened muscle tissue and edematous fluid revealed the anaerobe, *Clostridium novyi.*

E. E. Leasure,
Department of Pathology,
Kansas State College.
Manhattan, Kansas.

Intravenous Medication for Eclampsia

By E. J. FRICK, Manhattan, Kansas,
Department of Surgery and Medicine, Division of Veterinary Medicine,
Kansas State College

THE use of intravenous medication in humans and in the treatment of large animals is commonly accepted as good practice. Its usage in smaller animals has not been generally followed. The reason has probably been the lack of information regarding the technique of administration. The advantages are numerous. Intravenous medication is more scientific and its accuracy results in immediate and certain action. It implies the direct injection into the blood stream of a definite amount of material. The exact action of the material being known there is little question of results.

The blood stream is one of the most resistant tissues of the body. Its leucocytes combat organisms that invade it. It carries immune bodies against many infections. It removes toxins and is the means of transporting hormones, glandular extracts, food, etc., to all the tissues of the body. Altering the blood stream by the use of drugs causes marked changes in the bodily functions. The use of iodides has increased the leucocyte count. Colloidal iron and arsenic have been demonstrated to change the quality of the red blood cells. A good practical example of the newer form of medication with its successful results is the treatment of eclampsia in bitches with a solution of calcium chloride.

Intravenous injection in the dog

In the dog the most favorable site of injection for intravenous medication is the external saphenous vein on the lateral surface just above the hock joint. Either a 16 or 20-gauge sharp needle will do, though

the smaller calibered needle is better on smaller dogs. The usual difficulty experienced in trying to puncture the vein is due to the movement of the vessel rolling away from a dull needle. This can be prevented by holding the vein between the thumb and forefinger at the time of injecting. If you miss the vein insert the needle a little higher up the leg where the vein imbeds itself into the thigh muscles. Practice on a "skate" dog will give you the skill and confidence needed for future use.

On a number of typical cases of eclampsia in the bitch, we have given, from 5cc for a 20-pound dog to 10cc for a 40-pound dog, of a 20% solution of calcium chloride intravenously with uniform, immediate, successful recovery. There is some retching for a few minutes after the injection but the recovery has been prompt with no bad after effects on the mother dog or her puppies. Of course, the question of sterile syringe, warm solution, and slow injection need not be commented on. This newer treatment is a decided advance over the older methods. Try it on your next case.

"SWINGING" A SUCCESSFUL TREATMENT FOR CONVULSIONS IN DOGS

I have had gratifying success with a very simple procedure for bringing dogs out of fits. I refer to fits brought on by worms in the intestinal tract of puppies.

The first dog I tried it on was a Collie, four months old, which, when food was given, immediately developed a fit. The first symptom was a raising of the head and champing of the jaws, followed in a few seconds by falling down. The animal would remain in a fit for a few minutes and then gradually recover, but would be dull for half an hour or so. Other fits would follow at varying intervals, but one could always be produced by giving the animal food.

If, when the jaws begin to champ, the animal is raised by the elbows and swung backwards and forwards between one's legs or sideways for about half a minute, the fit immediately stops. This is such a simple treatment that it is probably very old, but I have never heard of it or seen it in print.

This is the only way I know of for quietly stopping such fits, but, of course, the result is only temporary; a vermicide is required for a cure.—H. T. Ryan, F.R.C.V.S., in *The Veterinary Record*.

RAW LIVER AS A TREATMENT FOR BLACKTONGUE OF DOGS

During the past two years raw liver has been used as a treatment for blacktongue of dogs with very successful results.

Raw hog liver has been found to give the most beneficial results and at the present time is much cheaper than beef liver.

Treating dogs by this method is very simple if they will eat it of their own free will. Give them one to two pounds a day according to their weight.

Should the patient be unable to eat on account of the pain and soreness of the mouth it is then necessary to force feed by placing the liver far back in the mouth and the patient thus forced to swallow. In such cases the amount of liver may be divided into two or three portions to be given at intervals during the day. The liver should be cut in small pieces to facilitate swallowing without causing undue pain.

Beneficial results are generally apparent on the third or fourth day of the treatment and as soon as the patient is capable of taking the liver voluntarily the forced feeding may be discontinued.

A few cases have been encountered wherein the patient was unable to retain the liver. One case vomited the liver the next day due quite likely to a closure of the pylorus.

The liver and brewers yeast treatment has given excellent results especially in out cases.

A mild antiseptic mouthwash has been used. A 1% solution of acriflavine is excellent for this purpose.

Cases of blacktongue will recur if the patient is returned to the original vitamine P-P (B_2) free diet. Owners should be instructed to feed a diet containing some raw liver or raw beef or other meat containing the P-P vitamine to prevent recurrence.

T. O. Booth.

Temple, Tex.

Gas Anesthesia of Animals

By W. A. YOUNG, Boston, Massachusetts

DURING the past twenty-five years, various anesthetic gases have become widely used by the medical profession. These gases have all had periods of popularity followed by a period of abandonment. In most instances, the use of a gas by the individual was discontinued because there was some apparent failure. However, most of these failures were due to either faulty administration or a lack of knowledge on the part of the anesthetist. Each anesthetic gas has gradually come back into favor with the medical profession just as both chloroform and ether came back and continue to be used extensively for anesthetic purposes after being almost entirely discarded as an aid to surgery.

Today, nitrous oxide, ethylene, oxygen, and carbon dioxide make up the principal group of gas anesthetics. Of course, nitrous oxide and ethylene are the two that produce the condition of anesthesia while we properly protect the patient by the administration of a necessary amount of oxygen and carbon dioxide to sustain life, as nitrous oxide alone would cause death. These gases may be readily combined with ether and a combination gas-ether anesthesia produced. The safest and most commonly used anesthetic gas is nitrous oxide. Its non-explosive character adds greatly to its safety when compared to ethylene. The safe administration of ethylene is carried out under rather delicate conditions in the operating room.

I shall confine my remarks principally to the use of nitrous oxide as aided by oxygen and carbon dioxide in conjunction with ether.

First, why the use of any anesthesia at all? This question is best answered by two reasons, as follows:

1. Comfort to the patient during the progress of the surgery.

2. Ease of operation and absolute control of the patient while operating so that one may perform properly the desired operation, and be in a position to handle any emergency, such as hemorrhage, etc., that may arise, and, finally, the application of an adequate surgical dressing.

After one has operated under good anesthesia, he has little desire to perform any extensive surgical operation without complete anesthesia. This is especially true in the case of small animals and my statements will refer largely to anesthesia of the smaller animals. However, gas anesthesia has been successfully produced in many of the larger animals. Its cost is rather prohibitive for the commercial farm animals.

Granting that chloroform, ether, and gas, and some anesthetics that may be administered hypodermically or orally, will produce a surgical general anesthesia, there remains the question of which type of anesthesia is best for both patient and operator. I have used many different types of anesthesia and consider the nitrous-oxide type far superior to any other I have ever used. I place ether second; all other anesthetics drop far below these two in value as surgical aids.

First, gas anesthesia is not objectionable to the patient as it is administered. The odor is rather pleasant, at least it does not set up a stage of fright. The period of anesthesia comes on rather quickly. I have had many a dog stand on the table without restraint other than a hand placed on its neck and without any struggling be anesthetized in two to four minutes. This procedure can best be described as wilting, the animal gradually relaxing under the effects of the anesthetic to the point of complete relaxation and insensibility to pain. No other inhalant anesthetic can compare to nitrous oxide in this acceptance by the animal. Gas is very flexible and you can change from one stage of anesthesia to another readily by the addition of an increased amount of oxygen or simply permitting a few breaths of fresh air or increasing the percentage of nitrous oxide being inhaled.

Pain is entirely absent under gas anesthesia and anesthesia may be continued safely for a long period of time. I have had patients completely anesthetized for pe-

riods ranging from one minute up to more than an hour. I have found no ill effects from protracted gas anesthesia. A very important point is the condition of the surgical patient as it regains consciousness following the anesthesia. No anesthetic approaches gas in the promptness of recovery following its use. The animal is in possession of all his faculties two or three minutes after the administration of the anesthetic is stopped. There are no periods of nausea, excessive salivation, nor delirium with whining and floundering, which always bring distress to the owners, attendants, and operators. Five minutes after a gas anesthesia a dog will walk across the floor with almost no evidence of ever having been anesthetized. It is a very pleasing sight to the owner to see his beloved pet go through as serious an ordeal as anesthesia for surgical purposes and in a very few minutes see him perfectly normal in so far as his faculties are concerned.

From a surgical standpoint, we avoid the danger of the animal's disturbing surgical dressings, sutures, or incisions that we have just very carefully accomplished. No doubt, all who read this have experienced patients tossing about as they recover from an anesthesia and doing more damage by their struggling than the operation corrected.

Any practical anesthesia must be safe. There are no more, and, in my experience, there are fewer collapses under gas than under any other anesthesia. Cessation of respiration may occur, but usually carries little or no danger to the patient.

The cost of the anesthetic is always of importance and on this point I am free to admit that the use of gas is more expensive than such anesthetics as straight ether, chloroform, or those administered hypodermically. The actual figures are about as follows:

For a dog of average size, say of fifty pounds weight, we would use nitrous oxide at the rate of 100 to 120 gallons per hour. For an operation of 15 minutes duration this means 25 to 30 gallons used; cost about 1.6c per gallon—in other words, 40c to 50c worth of nitrous oxide.

Oxygen is administered at the rate of from 2 to 10 gallons per hour. For this same 15 minute operation we would use ½ to 2½ gallons. Oxygen costs approximately 2c a gallon, the cost of oxygen for this operation being from 1c to 5c.

Carbon dioxide would be administered at the rate of about ½ gallon per hour. Its cost is less than 1c per gallon; consequently, carbon dioxide cost is practically nothing.

The cost of ether if used in conjunction with nitrous oxide will be very trivial, as one would not use more than a few cubic centimeters for a 15-minute operation. The machines are so made that the gases can be bubbled through the ether, permitting any degree of ether mixture desired by the anesthetist. This ether container is constructed so that unused ether may safely be retained for a subsequent operation even though it might not be performed that day.

These figures will total 50c or less per 15-minute operation on a fifty-pound dog. I am sure that the advantages of gas anesthesia well merit this added expenditure, which is less than double the cost of ether. True, we can produce general anesthesia for less money, but with this type of anesthesia we can produce it on a moment's notice and bring the animal back to full control of its faculties in a very short period of time and have a calibrated anesthesia where we can positively control the depth of the anesthesia. This is absolutely impossible with any anesthetic administered hypodermically, orally or rectally. Ether and chloroform can be

used to produce a quick anesthesia, but they require more careful preparation of the patient and the aftermath is certainly more objectionable than with gas.

Technique.—The patient is prepared by fasting over a period of one or two meals, usually missing only the morning meal on the day of operation. The average dog is placed on the table without hobbles or a muzzle. I am absolutely free to use these means of restraint on any dog that has an unruly disposition.

Cats are placed in a cat bag, which is simply a blue denim or canvas bag with a draw string that can be drawn up about the neck. The cat's body is inside the bag so that all four feet are under control. A face mask, which is simply a cone-shaped attachment, the edge of which has been covered with moist gauze, is applied over the face up to the position of the eyes, or even deeper.

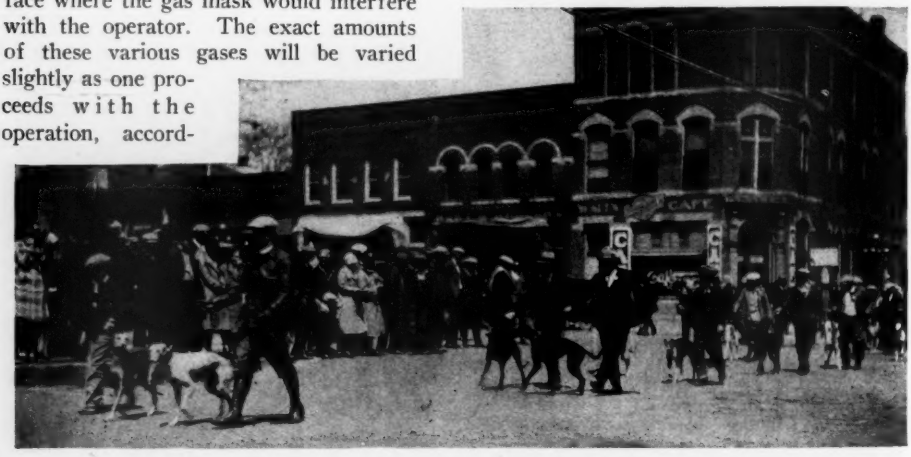
Nitrous oxide is admitted to the breathing bag at a rate of 100 to 120 gallons per hour, mixed with oxygen at the rate of about 10 gallons per hour and carbon dioxide at about ½ gallon per hour. After about one minute of this mixture, the oxygen is gradually cut down during the next minute or two, so that the flow is at the rate of 2 to 3 gallons per hour. This is the average mixture of the three gases that I ordinarily use. The gases may be bubbled through the ether to produce a more lasting anesthesia when we desire to operate in the mouth or that part of the face where the gas mask would interfere with the operator. The exact amounts of these various gases will be varied slightly as one proceeds with the operation, according to the reaction of the individual animal; giving more or less of each gas as the condition of the patient indicates.

The eye reflex is an excellent indicator of the stage of anesthesia. Simply keep the animal just to the stage of eye reflex. If in doubt, permit the animal to return to the stage of eye reflex, then continue the gas administration.

I have prepared a set of apparatus for tracheal anesthesia so that the anesthesia may be continued while oral surgery, dental extraction, etc., is being carried out. This apparatus is very simple and consists of a mare catheter, the curved end of which is placed in the trachea after the animal is anesthetized. The opposite end of the catheter is attached to a rubber tube which is connected with the T at the breathing bag. The pharynx is packed with gauze to prevent leakage of both gas and air about the end of the catheter. With this arrangement one may proceed to such oral, dental, or facial surgery as is necessary, with the patient under complete anesthesia and absolute control. There are no periods of half awakening to struggle, necessitating reanesthetization.

I use a Heidbrink machine such as is commonly used in human hospitals; all the apparatus is identical except for the face mask and my trachea apparatus.

Ref. Gwathmey's Text on Anesthesia, 2nd Edition.



Amytal Sodium Anesthesia for Small Animals

By R. A. SELF, Dallas, Texas

FOR the semi-wild animals of our zoological parks and especially cat and cat-like zoo animals the employment of ether, chloroform, A.C.E., mixture and like narcotics as a means of control for examining and perhaps for surgical operations, possesses the disadvantages of entailing respiratory and circulatory dangers which may prove fatal, requiring the continuous attention of an assistant as an anesthetist, and of involving preliminary restraint of the subject.

In the four years that I have operated my hospital I have been confronted with the problem of finding a drug that would act as satisfactorily and safely on cats and small caged animals as morphine acts on the dog.

During these four years I have experimented with various drugs and chemicals and I think I have found in one of these derivatives of the barbital group, sodium isoamylethyl barbiturate, sold under the trade name of Sodium Amytal, a narcotic that may be used in the cat tribe with safety and satisfaction that morphine gives in the dog. It may be used successfully on all small animals and is especially indicated for animals which morphine has a tendency to excite. The use of sodium amytal in these animals tends greatly to reduce the preoperative fear and excitement of the patient and permits the induction of surgical anesthesia with little effort. This drug is not only safe for preliminary, basal anesthesia but it can be used for general anesthesia, and spinal anesthesia, safely and with excellent results.

Sodium amytal is marketed by the Lilly Laboratories in 3-grain capsules, for oral administration and in sealed ampules for intraperitoneal, intramuscular and intravenous administration, or it may be given rectally if dissolved in a little water and injected as a small enema. However, in my work I have used the 3-grain capsules mostly orally or intraperitoneally, as I have been unable to get a sufficient amount of the ampules for my total needs, since the ampules have not been put on the market as yet and have been distributed only for clinical trial.

The following are a few transcripts of my laboratory records on hospitalized cats and dogs and caged animals on which amytal sodium was employed.

No. 1. Monkey weighing 8.5 kilos.
- 9:48 Injected intraperitoneally 475mg. (55mg. to each kilo).
- 9:50 Chews as if it tastes something.
- 9:58 Down.
- 10:03 Complete narcosis.
- 2:00 P. M. Awake, nearly normal.

No. 2. White Rats: These average 200gm. weight. Dosage 50mg. per kilo.
- 10:50 White rat No. 1 injected.
- 10:52 Rubs nose.
- 10:55 Incoordination.
- 10:60 Completely relaxed, but not quite narcotized.
- 11:15 Coming out.
- 11:30 Walks around but wabbly.

Rats No. 2, 3, 4 and 5 were given 60mg. per kilo and narcosis was sufficient in 14 minutes for major surgery. They were completely narcotized for approximately two hours.

No. 3. Rabbits: Five tested, weight from 2 to 2.2 kilo. Were given 50mg. per kilo, all behaved exactly the same.
- 2:55 Injected No. 1.
- 2:59 Hind legs drag.
- 3:05 Complete narcosis.
- 4:00 Temperature 101, Heart rate 200, Resp. 32.

Complete narcosis, sufficient for major surgery, for approximately one hour.

No. 4. Female Kitten: Weight 1 lb., 10 oz. to spay (complete anesthesia required). The average dose for cats is 60-65mg. per kilo.
- 2:44 1.4gr. sodium amytal given orally.
- 2:47 Sleepy, yawns and rubs face.
- 2:49 Rubs nose, incoordination develops, cat appears drunk.
- 2:51 Down and relaxed.
- 2:53 Complete narcosis.
- 3:15 Spayed with no apparent pain.
- 8:00 Next morning, drowsy but hungry and partakes of warm milk.
- 12:00 A. M. Up and very hungry—normal.

No. 5. Male Kitten: To castrate (complete narcosis not necessary).

3:47 1 gr. sodium amytal orally.
3:50 Sleepy, yawns and rubs nose and face.
3:53 Incoordination developing and meowing.
3:55 Down and relaxed.
4:00 On table and castrated without apparent pain.

No. 6. Female Cat: Age, 1 year; weight 6½ lbs. For spaying; complete narcosis.

1:47 3.5gr. sodium amytal by the mouth.
1:51 Mewing and yawning.
1:53 Incoordination developing and appears to have bitter taste in mouth.
1:59 Relaxed and down, but not quite narcotized.
2:06 Complete narcosis.
2:20 On operating table and is operated on; makes no resistance; suffers no apparent pain.
8:00 Following morning drowsy and hungry.
3:00 Apparently normal and no drug effects.

No. 7. Male Cat: To castrate, weight 10 lbs. 4 ounces. Complete narcosis not necessary.

9:37 3 gr. sodium amytal per os.
10:00 On table. One cc. Procain solution in scrotal tissues and castrated without apparent pain.

No. 8. Male Cat: Weight 11½ lbs. Strychnine poisoning.

9:44 25gm. sodium amytal intraperitoneally.
9:46 Mewing and excitement appears greatly.
9:48 Strychnine reflex less. It is necessary to hold the cat to keep him from getting up.
9:52 Legs relaxed and only slight strychnine reflex.
9:54 Cat completely relaxed and no strychnine reflex noticeable.
8:00 Next morning cat up but drowsy.
3:00 P. M. No drug effects noticeable.

No. 9. Male Police Dog: Weight 46 lbs. Strychnine poisoning.

6:23 A. M. 1gm. sodium amytal intraperitoneally.
6:27 A. M. Tries to get up and it is necessary to hold him down.
6:31 A. M. Lies down and appears sleepy and yawns; strychnine reflex present.
6:36 A. M. Legs relaxing and strychnine reflex lessened.
6:43 A. M. Relaxed and strychnine reflex gone.
5:40 P. M. Up but drowsy; however partakes of warm milk.
8:00 A. M. Following morning; no drug effects noticeable.

Of 60 cases of strychnine poisoning that I have treated in a period of over one year, I have not lost a single case in cats or dogs. These are the first cases of strychnine poisoning in cats that I have ever had recover.

From the experiments and the cases treated with amytal sodium I give the following as my conclusions:

1. The dosage varies with degree of narcosis desired; for complete narcosis 50-65mg. per kilo of body weight intraperitoneally; 55-75mg. per kilo per os will produce complete narcosis in 10 to 15 minutes. In strychnine poisoning lgm. to 5 lbs. of weight intraperitoneally relieves strychnine symptoms in 10 to 15 minutes.

2. The temperature, circulation, and respiration are depressed, therefore have warm blankets, warm room and if possible a hot water bottle available.

3. Introduced intraperitoneally or by the mouth, sodium amytal in appropriate dosage completely narcotizes the animal in 10 to 15 minutes, and thereafter the operator has no worries about maintaining the exact dosage. An anesthetist is not necessary. The fatal dose for animals is about 100mg. to each kilo of body weight; there is therefore a safety factor of approximate 33⅓%.

The uses of sodium amytal are:

1. Substitute for morphine as hypnotic or anesthetic. Sodium amytal has the advantage of neither nauseating, nor constipating the animal, and does not suspend the appetite as does morphine.

2. In combination with spinal or local anesthesia it protects the animal against toxic effect of local anesthetics from any of the cocaine derivatives.

3. In strychnine poison it is God's gift to the cat and dog and has truly a specific antidotal action for strychnine poisoning. This is the only drug I have ever used that is effective in strychnine poisoning of cats.

4. Eclampsia in bitches is controlled in 3 to 10 minutes.

5. Fits and convulsions can be con-

trolled more quickly and effectively than with any other barbital, chloroform, magnesium sulphate, or morphine preparation I have ever used. It is the only drug I have ever used that will successfully control the "dumb" type of fits, especially in those cases where they have one after another.

6. In general anesthesia in place of ether, chloroform, or A.C.E. mixture, etc., sodium amytal is successful and the dose can be regulated for minor to major operations, however, where sufficient sodium amytal is given to produce general anesthesia for major surgery I find a single objection in that the animals sleep too long and require much after care in changing the position of the patient, and turning them from side to side, as pulmonary edema may develop from insufficient aëration of the lungs. Therefore, I recommend the use of sodium amytal combined with spinal anesthesia or with local anesthesia where it may be given in small doses and used as a preliminary, basal anesthetic in the same manner as morphine.

7. I have mentioned the use of amytal sodium for cats in strychnine poisoning but I mention it again here and emphasize that in addition to its specific anti-spasmodic effect it is the only drug with anesthetic properties that I have ever employed that can be used successfully and without danger on cats and cat-like zoo animals. The dose can be regulated for spaying, clipping, bathing, etc. The big factor is that amytal sodium tends to abolish consciousness of pain, yet leaving the patient reflexly reactive to painful stimulation. I consider that the cat in such a state is ideal for restraint or for the addition of inhalation or spinal or local anesthesia.

After four years' use in a hospital I wish to say that in amytal sodium I have found a drug that has given me more uniform and specific action than any drug I have ever used on cats or cat-like zoo animals.

A CASE OF PROSTATITIS IN A DOG

Subject.—English bulldog, male, age five years.

History.—There had been complete retention of urine lasting for two days, three months previously. As the animal was not examined by a veterinarian at that time no diagnosis was made. The owner gave spirits of nitre with apparent success. The case on being presented to me had the same history of retention of urine for the past two days.

Symptoms.—Upon catheterizing no obstruction was found, but the urine was very thick and heavy. Urine analysis revealed nothing abnormal except a marked trace of albumen.

Treatment.—The animal was placed on hexamethylenamine, five grains, three times daily, and iron, quinine and strychnine with lactated pepsin, to receive a total of 1/120 grains of strychnine per day.

Sequelae.—The case improved satisfactorily and in five days the urine had returned to normal. The owner was called and told to come for his dog the next day. The dog was given a bath and the next morning showed very marked hematuria, which rapidly became worse until the animal was passing large quantities of blood. An X-ray examination was negative.

The patient was given 1cc of 20 unit pituitary solution every hour for four hours. The bladder was flushed out with 1/2000 solution of adrenalin chloride, which controlled the hemorrhage very nicely. No more severe hemorrhage occurred but drops of blood appeared before each urination.

Rectal examination revealed a greatly enlarged prostate. This was massaged per rectum for two minutes twice daily. Following each massage large quantities of blood came away. In a week the prostate had returned to normal. However, blood still appeared before each urination, and especially so if the animal became quite active. After a period of three weeks, during which the treatment consisted of urinary antiseptics, 1cc of 20 unit pituitary solution daily, flushing the bladder twice daily with adrenalin chloride solution and a general tonic treatment, no improvement was seen.

All treatment was then discontinued for the period of a month. At the end of that period the urine had cleared up, and the blood disappeared.

This animal has been perfectly normal ever since (over two months). Whether or not the prostate gland was enlarged when I first saw the case I do not know, as I made no rectal examination at that time.

J. Stuart Crawford.

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SAND COLIC IN DOGS

During the summer months we receive at the hospital from 50 to 75 dogs suffering from colic. Most of these dogs are of the smaller breeds: white poodles, pekes and poms, the pets of the summer visitors to the beaches. Before long these dogs find their way to the beaches and then to the hospital, some visiting us two and even three times during the season. Many of these cases are brought to us late in the evening, after the hospital is closed. All rather the worse from such friendly advice and neighborly treatment as worm medicine, buckthorn, castor oil, etc. Nearly all these dogs have been in pain during the day, and as evening approaches and the dog seems no better (and the possibilities of sleep being small as long as the dog is in the house and crying) they decide to consult a veterinarian.

These cases rarely show any fever, a temperature of 102°-102.5° F., pulse and respirations slightly increased, the dog is restless and uneasy, moving from place to place uttering sharp cries of pain, followed by a few moments of rest before another spasm of pain occurs.

The treatment is quite simple. A high bicarbonate of soda enema is administered. After the lower bowels have been emptied the solution is allowed to flow up into the intestines and stomach and is expelled by vomiting. Two or three tablespoons full of sand are evacuated in this manner. This washing out is continued until clear water is thrown up. One H. M. C. tablet is given to relieve the pain, which will last 24-48 hours. Occasionally it is necessary to repeat the H. M. C. During recovery the dogs will lie on their backs for hours, this position appears to give them some relief from the pain. Food is withheld for at least 24 hours, after which a little milk is given.

Most of the cases recover, if received in time, provided of course they have not had too much home treatment. The mortality is about 10%. These sand colics are most common among the city dogs; we seldom have this trouble among the native dogs, which are on the beaches all year round.

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A Southern California Veterinary Hospital